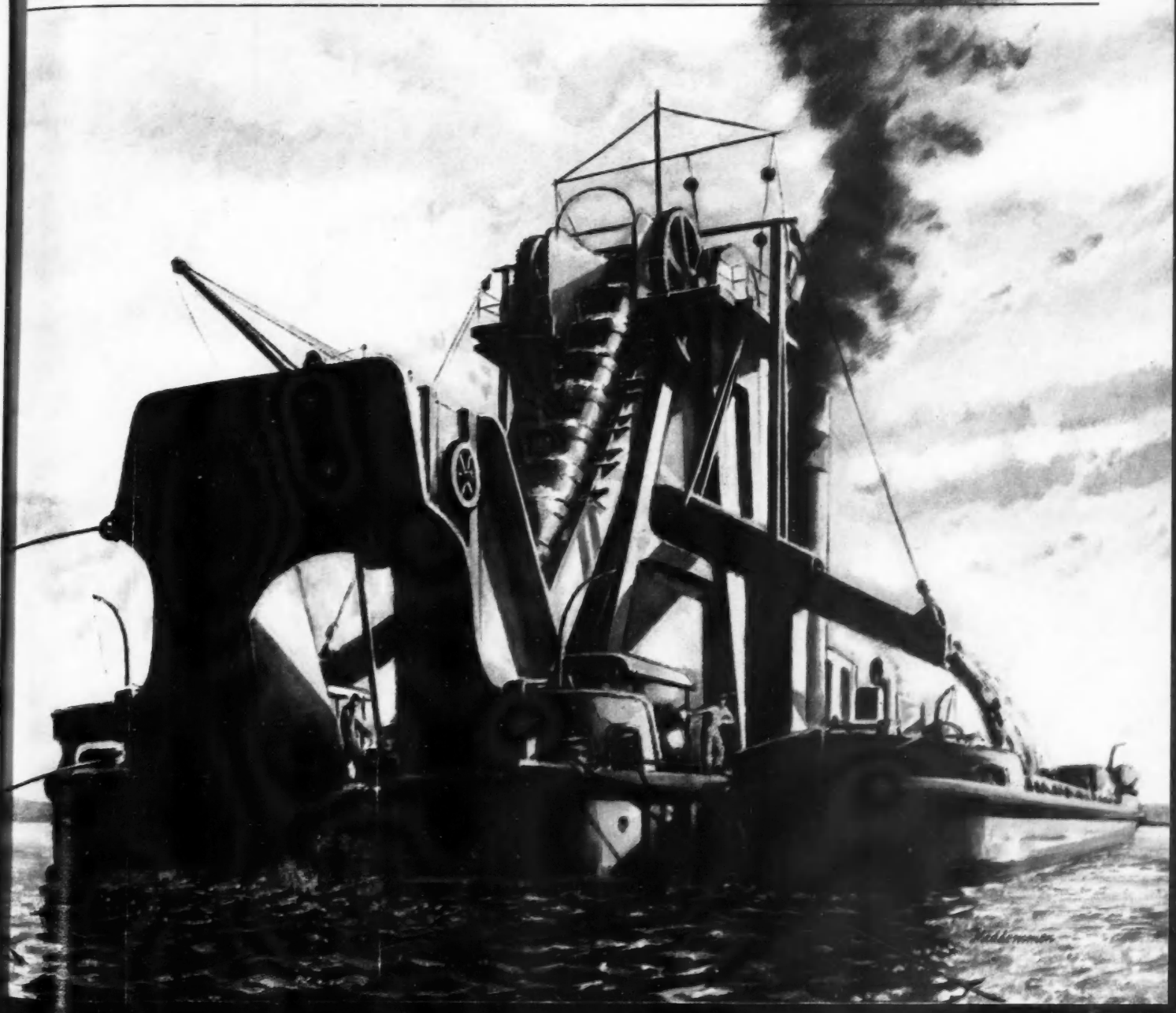
OCT 19 '55

The Dock & Harbour Authority

UNIVERSITY OF MICHIGAN
OCT 18 1955
TRANSPORTATION LIBRARY

No. 419. Vol. XXXVI. SEPTEMBER, 1955 Monthly 2s. 6d.



The Organisation with 3 Centuries of Dredging Experience

WESTMINSTER DREDGING CO. LTD.

2-14 DARTMOUTH STREET, WESTMINSTER, LONDON, S.W.1

Tel. Trafalgar 6835-6 *And at BROMBOROUGH, CHESHIRE* Rock Ferry 2233-4

CONTRACTORS TO THE ADMIRALTY AND CROWN AGENTS

Aids to Navigation

Navigation buoys must go almost as far back in history as the history of shipping itself. Nevertheless, it was not until the adoption of the Uniform System of Maritime Buoyage in 1948 that the shapes and colours of buoys were more or less standardised in all countries, so that in any part of the world a can-shaped buoy is now port-hand : starboard-hand buoys being conical.

PRIESTMAN

Wherever shipping must come to safe harbour, you will invariably find that Priestman Grab-Dredgers are chosen to keep dock approaches and berths clear. This, because during the past three-quarters of a century the name Priestman has become synonymous with reliable efficiency . . . and stands for equipment which really does its job better and for longer periods.

PRIESTMAN BROTHERS LIMITED - HOLDERNESS ENGINEERING WORKS - HULL - ENGLAND

B/A

To Correspondents

All Letters and Contributions intended for Publication should be addressed to the Editor:—K. R. Doggett, Assoc.I.C.E., **"The Dock & Harbour Authority," 19, Harcourt Street, London, W.1,** and must in all cases be accompanied by the name and address of the sender.

To Advertisers

Our circulation is world-wide, and we have subscribers in 83 countries. For Advertisement Rates and particulars of space available apply to the Advertisement Manager, 19, Harcourt Street, W.1.

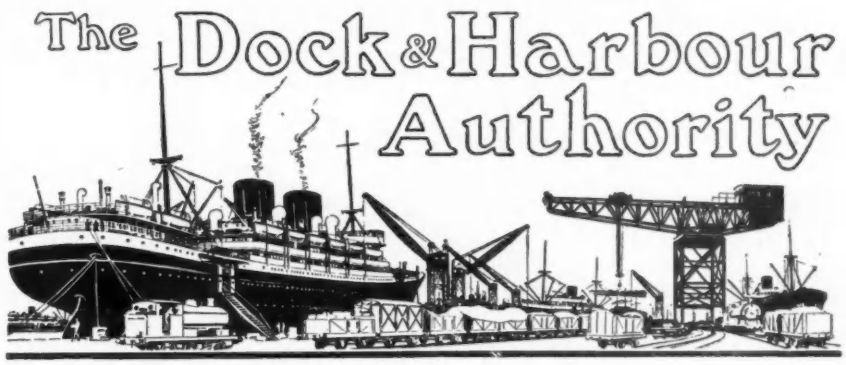
Subscription Rates

PER 2/6 COPY
(plus 4d. postage).

Annual Subscription:—
United Kingdom ... £1 10s. 0d.
Abroad ... ... £1 12s. 6d.
(post free anywhere).

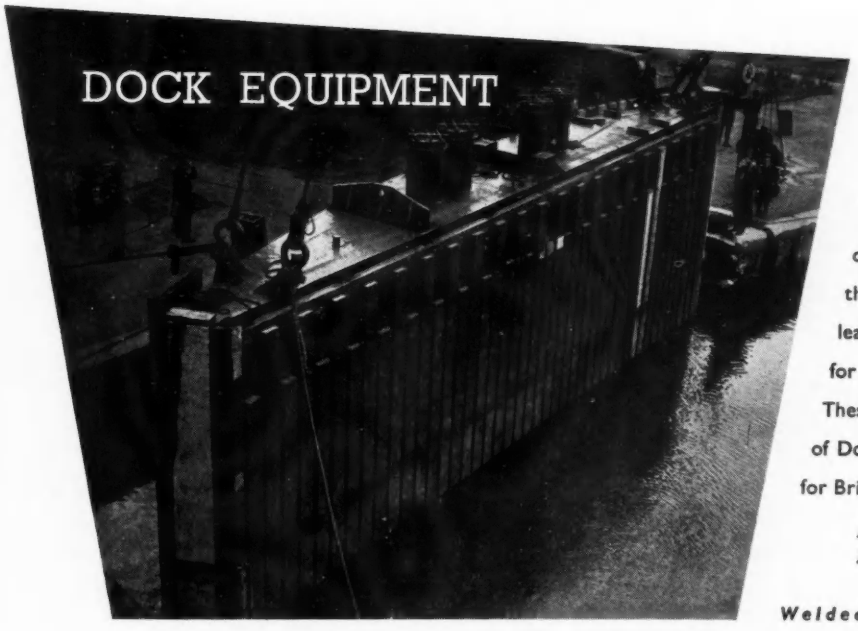
All subscriptions must be Prepaid. Postal Orders and Cheques should be addressed and made payable to FOXLOW PUBLICATIONS LTD., 19, Harcourt Street, London, W.1, and crossed Midland Bank, Ltd.

Telephone: PAD 0077 and 0078.



CONTENTS

EDITORIAL COMMENTS	135
THE PORT OF BASLE	137
THE ROLE OF THE CORPS OF ENGINEERS IN THE U.S.A.	143
PORT PUBLICITY	144
CAPE SPARTEL SIGNAL STATION	146
COAL SHIPPING ON TYNESIDE	147
FORK-LIFT TRUCKS IN DOCKS	150
DEVELOPMENT OF A MUD CLEARING VESSEL	151
A NEW TYPE OF FENDER	152
H.M. CUSTOMS IN BRITISH PORTS	154
CARRIAGE OF BULK GRAIN BY TANKERS	157
OBITUARY	158
PORT HEALTH AUTHORITIES	159
BRITISH INLAND WATERWAYS AND THE TRENT NAVIGATION	160
BREAKING WAVES	164
PERSONALIA	166
MANUFACTURERS' ANNOUNCEMENTS	167



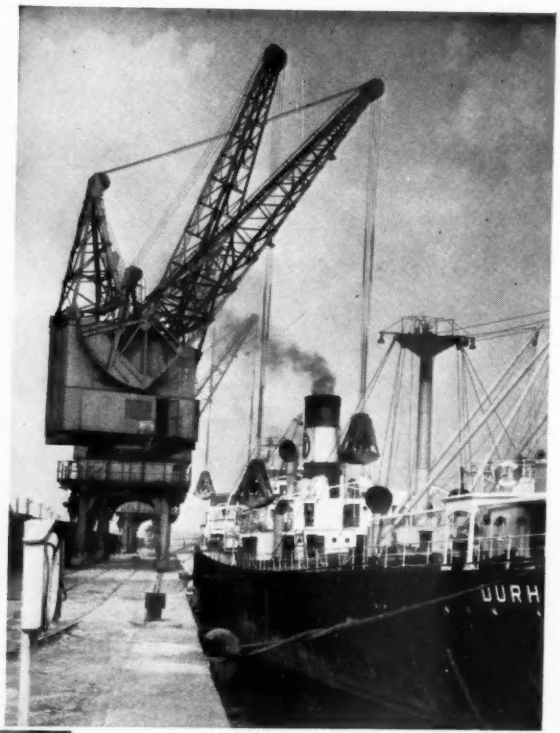
The illustration shows the stepping into position of one leaf of a pair of 100' Entrance Gates for the Port of London Authority. Each welded leaf weighs 240 tons, compared with 350 tons for each riveted leaf which it is replacing . . . These gates are illustrative of eight pairs of Dock Gates at present under construction for Britain's Docks, Harbours and Waterways.

DOCK GATES *CAISSONS*
FLOATING DOCKS *SLIPWAYS*
MOVABLE BRIDGES
Welded or Riveted Construction

HEAD, WRIGHTSON & Co. LTD.
THORNABY-ON-TEES • STOCKTON-ON-TEES • MIDDLESBROUGH • LONDON
JOHANNESBURG • TORONTO • SYDNEY, N.S.W.

296—Rd

Five $7\frac{1}{2}$ tons Clyde Level Luffing Cranes . . .



Photographs by courtesy of the Manchester Ship Canal Company.

as supplied to the Manchester Ship Canal Company

Grab handling of bulk cargoes demands continuous working and high output and the cranes depicted are the result of long experience and specialised study of this subject.

CLYDE CRANES

We are well equipped to advise and assist in the problems of bulk cargo handling and quicker turn-round.

CLYDE CRANE & ENGINEERING CO. MOSSEND · LANARKSHIRE *Telephone: Motherwell 354/5 Telegrams: "Clyde, Motherwell"*

Associated with JOSEPH BOOTH & BROS., UNION CRANE WORKS, RODLEY, LEEDS. Proprietors: CLYDE CRANE & BOOTH LTD.

1955

The Dock & Harbour Authority

An International Journal with a circulation extending to 83 Maritime Countries

No. 419

Vol. XXXVI.

SEPTEMBER, 1955

Monthly 2s. 6d.

Editorial Comments

The Port of Basle.

It is interesting to note that the city of Basle owes its position as the second largest city in Switzerland to two main causes; first the construction of the St. Gotthard Railway, which has served to make Basle the focal point for the collection and redistribution of merchandise which is received from every part of north and central Europe. The second favourable factor concerns its situation on the Rhine. This River, being the only direct navigable link between Switzerland and the sea, affords essential water transport facilities, particularly from the seaports of Antwerp and Rotterdam. These two features have given great importance to Basle both as a port and as a trading centre.

Our leading article for this month gives a description of the port of Basle from its inception to its present position as an important river port. There is also an interesting account of the works involved in the deepening and straightening of the Upper Rhine, and a description of the building of the Grand Canal of Alsace. This impressive undertaking, which has been of such benefit to Switzerland and the other riverain States, emphasises their dependence on a waterway which can accommodate the larger vessels used to-day for inland transport.

Since the conclusion of the recent World War, the trade of the port of Basle has shown a steady upward trend, and last year the volume of cargo handled amounted to nearly 4,000,000 tons. There is little doubt that under the present enterprising management these figures will continue to increase.

The River Trent and the Economics of Waterway Transport.

We publish on another page an article by our correspondent commenting on the past history, present condition and future prospects of the Trent Navigation, an important waterway route linking the Midlands with the ports on the Humber. A study of the fortunes and hopes of this enterprise illustrates significantly certain important principles affecting the economics of inland water transport in Great Britain, and, indeed, elsewhere. The most important of these principles concern the size of craft which can be accommodated and whether they can also act as lighters in port areas. It cannot be too strongly emphasised that, when the barges which are to carry merchandise between inland industrial areas and the ports can also act as lighters in the docks, the waterway starts with an important advantage in offering economies in discharge between inland carrying unit and seagoing ship. Furthermore, if the goods do not have to pass over the quays and thence onto road or rail vehicles, welcome relief from traffic congestion in the docks results. On these two counts, the Trent route is favourably placed, and the enterprise of the various companies and corporations which have controlled it, has resulted in its history being one of continuous development.

Influences, which at one stage in history had one effect, often work in an altogether different direction later. Such has been the case with the navigable routes which join the Trent at Nottingham—the point farthest inland along the direct line of the river reached nowadays by boats of economic size. In the early nineteenth century, when sail, the ebb and flow of tides, and horses were the means of propulsion, the larger Trent boats could only come up the river from the Humber, using the tide and their sails, as far as Newark. There the goods were trans-shipped to horse-drawn boats of shallower draught for the transit to Nottingham, over a part of the river which was then very difficult due to the rapid flow of the shallow river. Despite these and other difficulties, however, there was a healthy traffic as far as Nottingham for many centuries. The construction of the Nottingham and Beeston canals together with the Trent and Mersey canal and others provided, for points inland of Nottingham, routes welcomed as much safer and easier for horse-drawn boats than any river could be. At that time, rivers, due to the hazards and delays experienced on them, compared unfavourably with the tranquil canals; such canals were, very reasonably, constructed to dimensions no greater than was necessary to pass the smaller boats which could work above Newark, as well as narrow boats such as frequented most of the canal network of the country. Furthermore, the pattern of trade resulted in a considerable traffic across the country, for example, from the Trent to the Mersey, Thames and Severn, in horse-drawn narrow boats.

The situation to-day is different. Inland waterway transits right across the country are no longer demanded and the traffic which remains competitive is broadly that between port areas and inland industrial centres. The Trent now carries a substantial trade in powerful motor vessels, which, with recent improvements, can bring cargoes of up to 250 tons to Nottingham, and can cope with flood and current. Beyond this point the Trent is navigable no farther, although it is still wide and apparently capable of being developed to accommodate powered craft. The above and other influences from the past have resulted in any traffic inland of Nottingham having to pass over restricted canal routes, although many of these routes farther inland consist in part of the upper Trent and its tributaries.

Thus, the effective limit to economic cargo carrying lies at Nottingham. Beyond that, the maximum carrying unit is a boat or pair of narrow boats with a capacity of 50 tons. Several ambitious schemes for an enlarged inland waterway system, which could compete effectively with alternative forms of transport, have included extensions of the Trent route towards Birmingham. Unfortunately there seems no immediate prospect of their adoption, but it does seem immmediately practicable to extend this limit as far as Burton-on-Trent and also to Leicester, following the Soar. The latter river is, of course, already canalised to Leicester and connected with the Grand Union route to London, for small boats. Until quite recently there was considerable narrow boat traffic from Nottingham towards London, but with its present gauge it no longer appears able to compete. However, admirable foresight has been shown in enlarging the locks, whenever they are under major repair, to Trent boat size. There remain a few locks and a larger number of bridges, which are of restricted dimensions, and an extension of the limit in this direction for boats of economic size from the Trent would also mean extensive dredging. Nevertheless, the British Transport Commission, and all those bodies and persons who are genuinely anxious to revive waterway transport, would be well advised to press this and similar projects. In this case, advantage would be taken of the existing substantially satisfactory route from the Humber to Nottingham, the journey time over which at present is well under 24 hours from the docks.

Editorial Comments—continued

The St. Lawrence Seaway and Flag Discrimination.

A number of Candian and American shipping organisations have recently expressed concern about the increased foreign competition which they expect from the opening of the St. Lawrence Seaway in 1957. The Dominion Marine Association has proposed that Canada and the U.S.A. should collaborate in excluding other nations' shipping from much of the traffic on the Great Lakes and St. Lawrence River. This proposal is in line with the views of the Lake Carriers' Association, the U.S.A. counterpart of the Marine Association, and a resolution in similar terms was introduced to the U.S. Congress last year and referred to the Senate Foreign Relations Committee.

Representing 22 companies connected with the Great Lakes and St. Lawrence Waterway route, the Marine Association has recommended to the Royal Commission on coastal trade that a Canada-U.S. treaty should be negotiated which would bar ships of other countries from trading between Canadian and U.S. inland ports. The line would be at the mouth of the St. Lawrence. It is also proposed that traffic between Canadian ports in the same area should be confined to Canadian-registered ships and that a similar restriction should apply to the Eastern Canadian seaboard so far as it is sought by individual members of the Association.

The Association argues that United Kingdom and foreign interests could build ships specifically to compete with Canadian vessels after completion of the St. Lawrence Seaway project, and declares that " it is essential that Canadians be assured that the vast Seaway expenditure will not destroy efficient and profitable Canadian enterprise essential to the prosperity and economy of the nation."

In a memorandum prepared for submission to the Royal Commission on coastal shipping early last month, Canada Steamship Lines Ltd., one of the biggest owners of Great Lakes shipping, declared that Canada's coastal trade should be restricted to Canadian-built ships from 1957 onwards, because otherwise British ships, with their lower operating costs, would put Canadians out of business. They pointed out that Canada is one of the few leading maritime nations whose ships have to fight for a share of their country's coastal commerce.

In opposition to the foregoing agitation for a monopoly of the coastal shipping. The Maritime Transportation Commission pleads for free Commonwealth competition in Canadian waters. It argues that a monopoly would increase transport charges in Atlantic provinces. Further, Mr. Joseph Smallwood, Premier of Newfoundland, has declared that elimination of British ships from the trade would spell disaster for Newfoundland, as it was essential that that country should have the benefit of low transport costs.

It is understandable that Canadian shipping and shipbuilding interests are concerned as to the possible effects upon them of the opening of the St. Lawrence Seaway, but it is doubtful whether a policy of flag discrimination would, in the long run, benefit the Dominion, which is likely to gain more if the Seaway becomes, in fact, an international inland sea route, open to ships of all countries. It is equally understandable that Canada should wish to restrict to Dominion tonnage the carriage of coastal trade cargoes, but surely it would be far better if Canadian enterprise could, by efficient management, compete with the lower shipping charges of rival nations rather than compel Canadian users of coastal ships to pay higher rates in order to defray the costs of a discriminating national shipping policy.

Road Congestion and the Problem of Dock Delays.

A Conference convened by the Road Haulage Association for the purpose of investigating the serious situation arising from delays to road transport in docks is to be held on September 22nd. It will be attended by representatives of trade and industry, chambers of commerce, wharfingers and shipping agents.

The Association has obtained evidence that these delays, sometimes lasting several days, are the result of inadequate roadways and warehousing facilities, the lack of organisation to spread deliveries to a ship over a period and, in some cases, lack of sufficient labour. Instances of delays are widespread at many U.K. ports, including London, Liverpool and Southampton.

Lately attention has been drawn to the fact that port delays are as much due to inadequate facilities for transport and handling as to dock labour problems. In exploratory talks held recently between the Liverpool Steamship Owners' Association, the Mersey Docks and Harbour Board and the Master Porters' Association, various proposals were put forward with the object of working out a formula to ease congestion on the quays. Faced with heavy financial losses because of delays, the shipowners have set up a special committee to consider the situation, and it is understood that one of the proposals likely to receive serious consideration is the more rigid enforcement by the board of penalties for leaving goods on the quays beyond a reasonable period. It is contended that much of the congestion is due to the practice by some importers of leaving their goods on the quays for longer than the 72 hours non-chargeable period, and that after that time their cargoes should be compulsorily warehoused.

The problem of approach to the ports is to-day complicated by the handling of large indivisible loads. Since loads of this type can rarely be brought by rail, they travel by road with the inevitable dislocation of the local traffic due to the width or length of the vehicles involved. As the method of transport is generally outside the jurisdiction of port authorities, there can be no solution until vigorous steps are taken to rehabilitate our out-of-date highways. Those engaged in modernising our ports must concentrate as much on good approaches as on rebuilding the quays and harbours.

A point to bear in mind is that as the Railway Companies' re-equipment progresses—even although it will take at least 15 years to accomplish—they can expect to regain a certain proportion of the traffic they have lost to road transport since the war. Therefore when providing adequate facilities for loading and unloading inland transport at the docks, it is important that the berths should be equally available for railway wagons and road vehicles as occasion demands. One suggestion is that railway lines—which at present stand behind the dock shed—should be moved further away along the length of the shed; and then a series of bays should be built which would be served by branches level with the railway, so that they could be used by any type of vehicle. Thus it would be possible to move lorries or wagons in or out of any one bay without interfering with vehicles in other bays.

The speedy turn-round of ships is essential in keeping down freight rates, hence in maintaining favourable price quotations on export goods. There is still a great deal to be done in modernising existing handling methods and also in developing new ones. The bulk carriage of goods has affected certain trades already and the extended use of stillages and pallets for fork-lift trucks and conveyors will cause even more changes. One solution to the problem of dock delays would be to develop mechanical handling to a point where the consequent reduction in labour requirements would permit double shift working.

Another suggestion for facilitating the speedier handling of goods is that the existing customs procedures and Board of Trade requirements should be cut down and simplified as these often hamper the swift flow of merchandise.

There is no doubt that the problem of dock delays is a complex one, due to a variety of causes and impossible to resolve in one step. It will need time and patience before many of the bottlenecks in the individual ports are eliminated. Since major sea-ports are invariably surrounded by heavily built-up residential or commercial areas, expansion is never easy, but nevertheless many ports are engaged on schemes for extending and improving their existing installations and cargo-handling equipment. All this takes time, but certain improvements could be carried out immediately. There could be closer co-operation between port authorities and shippers. For instance, a better organisation of delivery of goods to the ships is needed. Of the five days allowed for loading dates, all too often little use is made of the first day or two, which has resulted in lorries being turned away at the end of the period. There is also the vexed question of relations between dockers and employers; if there could be closer liaison between these, there would be a firm step forward in obviating the present dock delays. The improvements to the handling and transport facilities at ports must of necessity take longer to accomplish, although until this is achieved there can be no lasting solution to the problem of congestion.

The Port of Basle, Switzerland

The Remarkable Development of a New Port

(Specially Contributed)

THE city of Basle which is the second largest city in Switzerland is situated on the frontiers of two foreign States, France and Germany. It is favourably placed physiographically on the banks of a large natural waterway leading to the sea. It is also one of the main transit junctions of Europe connected by road and rail to all parts of Switzerland and beyond the frontiers. From Basle there is a regular flow of traffic through the tunnels of the Alps to Italy, France and Germany. Prior to the beginning of this century there had been several handicaps to the development of the fluvial traffic by the river Rhine to the river ports and to the sea. These disabilities were economic and physical. The former were the many tolls and customs dues levied on various stretches of the Rhine, no less than 40 at one period, and the latter the natural barriers on the bed of the river between Basle and Strasburg.

About the middle of the last century the first mechanically propelled vessel made one passage to Basle. A much more important event however took place in 1870 when all dues and tolls levied on the Lower Rhine traffic were abolished. This fact encouraged two or three Swiss engineers (1904) to attempt to prove that the Upper Rhine navigation could be commercially possible. They towed two barges carrying 300 tons of coal over the barriers and into Basle. This traffic increased gradually and with great difficulty to 48,000 tons by 1910 and reached a peak of 61,000 tons in 1914 when hostilities put an end to it until 1918. On resumption the average traffic annually for four years did not exceed 22,000 tons and then dropped to 700 tons a year later.

About this time the Central Commission for the Navigation of the Rhine (C.C.R.) became interested in the regularisation of the Upper Rhine from Strasburg to Basle, and French and Swiss Engineers collaborated to investigate the problem. The most difficult obstacle was the rocky Istein bar over the river bed four miles downstream from Basle. To obtain first-hand information about this the C.C.R. as a body decided to make the voyage from Strasburg to Basle. There were 30 delegates aboard the chartered steam tug for the 70 mile journey upstream against the strong current and tortuous channel. The voyage occupied 30 hours and as related by the present French Ambassador Adrien Thierry who is now President of the C.C.R. and was then one of the delegates: "to make the passage over the Istein bar the captain of the vessel formed the passengers into a group first forwards and then aft to alter the trim of the keel over the rocky ledges of the river bed."

Untying Political Shackles.

About 150 years ago, in connection with the international regimen of the Rhine, the Convention of Octroi (the body empowered to levy tolls or dues) had already an organisation which had the authority of a direct international administration, of which the director general internationally assumed the functions of the controlling power.

Then the Congress of Vienna in 1815 created the regimen of the Rhine which has functioned to this day. The intention was to found a central authority whose mission would be the animation of smooth working of the traffic and safe-guarding the principles of liberty of navigation, and equality of treatment. To this end the political powers at Vienna planned the Central Commission for Rhine Navigation (C.C.R.) that the riverain States were obliged to establish, and in August 1816 the plenipotentiaries of Baden, Bavaria, France, Holland and Prussia met for the first time. Their duty was to remould what remained of the system of Octroi and to put into effect the principles designated by the Congress of Vienna in articles CVIII and CXVII of the final Act, relating to the rivers separating or traversing several States, and the annex 16B regarding the Rhine.

The first convention on the Rhine navigation was signed at Mayence March 1831 and was revised at Mannheim October 1868. These two international instruments fixed the duties and the powers which have been since then those of the C.C.R. with the exception of the control of the previous lifting of the rights of navigation which were suppressed between 1850 and 1860 and were confirmed by the Convention of Mannheim. The function of the C.C.R. is essentially to form a permanent diplomatic committee in which the neighbouring riverain States can concert their Rhine policy, and the administration of the river to assure that navigation should be free from all technical, administrative, fiscal and customs interference and further, to safeguard the prosperity of all who earn their livelihood on the river; also to elaborate the general regulations, to examine the projects of all hydraulic works, construction of bridges, etc., and to act as an Appeals Tribunal in affairs judged in the first instance by sub-tribunals of the navigation of the Rhine.

The Treaty of Versailles added to the composition of the C.C.R. by giving places at the table to Great Britain, Belgium, Switzerland and Italy (who retired in 1937). Since 1945 the United States of America has joined the board and in 1949 a special conference for the shipping interests and crews of the Rhine fleets met at Geneva under the auspices of the International Bureau of Labour in collaboration with the C.C.R. to prepare a technical agreement concerning the social security of Rhine labour. This document was signed in Paris by representatives of the riverain States and Belgium in 1950. In 1952 the C.C.R., concerned about the sharp fluctuations of the Rhine traffic in the past, sponsored a conference of all the Rhine labour interests to even out inequalities and establish means to secure to all parties equal shares in Rhine prosperity.

Training Works of the Upper Rhine.

Fifty years ago the river bed of the Rhine between Strasburg and Basle was rendered extremely difficult to navigation not only by the strong currents but also by the large number of moving gravel banks. These shifting masses besides obstructing the river bed caused the navigable channels to meander with sharp curves and dangerous eddies for shipping. With the seasonal changes also the depth of water varied dangerously so that on 285 days of the average year there was less than 2 metres water depth in the navigable channels. It was therefore impossible for the large Rhine ships to proceed beyond Strasburg. The most difficult stretch was the river bed barrier at Istein where the surface waters were always greatly agitated.

To overcome this difficult stretch of river the Swiss Engineer Rudolf Gelpke (1873-1940) showed in 1904 that the possibility of navigation was not insurmountable by actually towing two loaded lighters of 150 tons each into Basle. His pioneer effort aroused interest of a substantial kind and eventually, but not without many heated discussions of the riverain States, the regularisation of the Upper Rhine was undertaken (1907-1912). The aim of the river training works was to straighten up the navigable channel, maintain it in position, and to increase the depth of low water to suit the needs of the larger Rhine shipping. In 1930 the question again arose and extensive works of regularisation between Strasburg and Istein was begun mostly at the cost and persistence of the Swiss. Above Istein to Basle there had already been commenced (1928-1932) the first stage of the Grand Canal of Alsace at Kembs, which draws off the waters of the river Rhine between Istein and Basle, as described later.

The first stretch of the Grand Canal (Fig. 2) is entered direct from the Rhine, and then runs almost parallel to it, by-passes the Istein barrier, and again enters the Rhine after down locking at Kembs. This stretch is 7 kilometres long and the second stage of the canal from Kembs to Ottmarsheim is 16 kilometres long from lock to lock. On completion of the first flight, the second was undertaken after excavating a temporary navigable channel, below the Kembs locks, through the flanking wall of ground separating

The Port of Basle, Switzerland—continued

the canal from the Rhine. On completion of the second stage, Kembs to Ottmarsheim, this gap was closed up, and another similar one was excavated below the Ottmarsheim locks. Thus it is clear that as the canal stages were completed and put into use the by-passed open Rhine lost much of its importance to navigation.

It was foreseen that the construction of the Grand Alsace Canal would render the continued maintenance of the navigable channel by training works less necessary and that the capital expenditure thereon would have to be recouped by a coresponding increase in the volume of traffic. Regarding this matter the Bundesrat (Governing Body) in its directive of 6th August 1929 pointed out that the regularisation works on the open Rhine were a necessity and unless they were started at once the Rhine between Strasburg and Basle would become more and more difficult and shipping would be forced to cease.

"Thus," said the Bundesrat, "the conseqence would be that until the opening of the side-canal say in 10 years time the shipping to Switzerland would be possible only by detour through the existing Rhone-Rhine Canal system. This canal passes from the Rhine at Strasburg and re-enters the Rhine at Hüningue (French Basle). It would only be suitable for craft of 300 tons and in view of the fact that the Rhine ship type is of 1,200 tons the Rhone-Rhine canal would be of no use. Besides, the canal lies entirely in French territory and competes with the free Rhine and also with the future Grand Alsace Canal: further, it is not subject to the rules and regulations of the Rhine Shipping Act."

Fig. 3a. St. Johann Wharf, on the left bank of the Rhine occupying the space between the Bridge of Three Roses in the foreground and the French Swiss frontier in the top right background just behind the tanks. It is a cramped site with a rail access bottle necked against the frontier line.

It will be appreciated that three nations, French, Swiss and German, were directly concerned with the enterprise of opening up this extension of the Rhine Navigation to Basle and beyond. In the proposed works the division of the burdens were that the regularisation of the open Rhine would be shouldered by the Swiss and the Germans, whereas the side canalisation would be a French enterprise. The works of regularisation are now almost completed and after some determined period when their stability and efficiency are proved satisfactory to their purpose, then both France and Germany, according to existing conciliatory agreements concerning their territorial rights over the works as situated, will take them over, whereas Switzerland will become progressively free of liability, probably in 1962, in this respect.

The cost of the Rhine training works between Strasburg and Istein was apportioned according to the Swiss-German States Treaty of 28th March 1929 in which 60 per cent. would be borne by the Swiss and 40 per cent. by the Germans with the proviso that the Rhine condition of free shipping should obtain beyond Basle to Lake Constance. It was further agreed that the execution of the extension shall be shared in the proper economic proportions.

Grand Canal of Alsace.

Basle and Switzerland owe a great deal to the enterprise and energy of the promoters and engineers of the Grand Canal of Alsace. Indeed from the date of completion of the first stage, Basle to Kembs, a new and monumental chapter was written in the economic history of Switzerland. These works of canalisation inspired by French engineers in collaboration with Germany and Switzerland are of a kind to confer a lasting social and economic benefit upon these three riverain nations and tend to weld them into yet further amicable relationship. The outstanding bond is the principle underlying their mutual efforts: that of proper shares in a common interest which is the Freedom of Rhine Shipping.

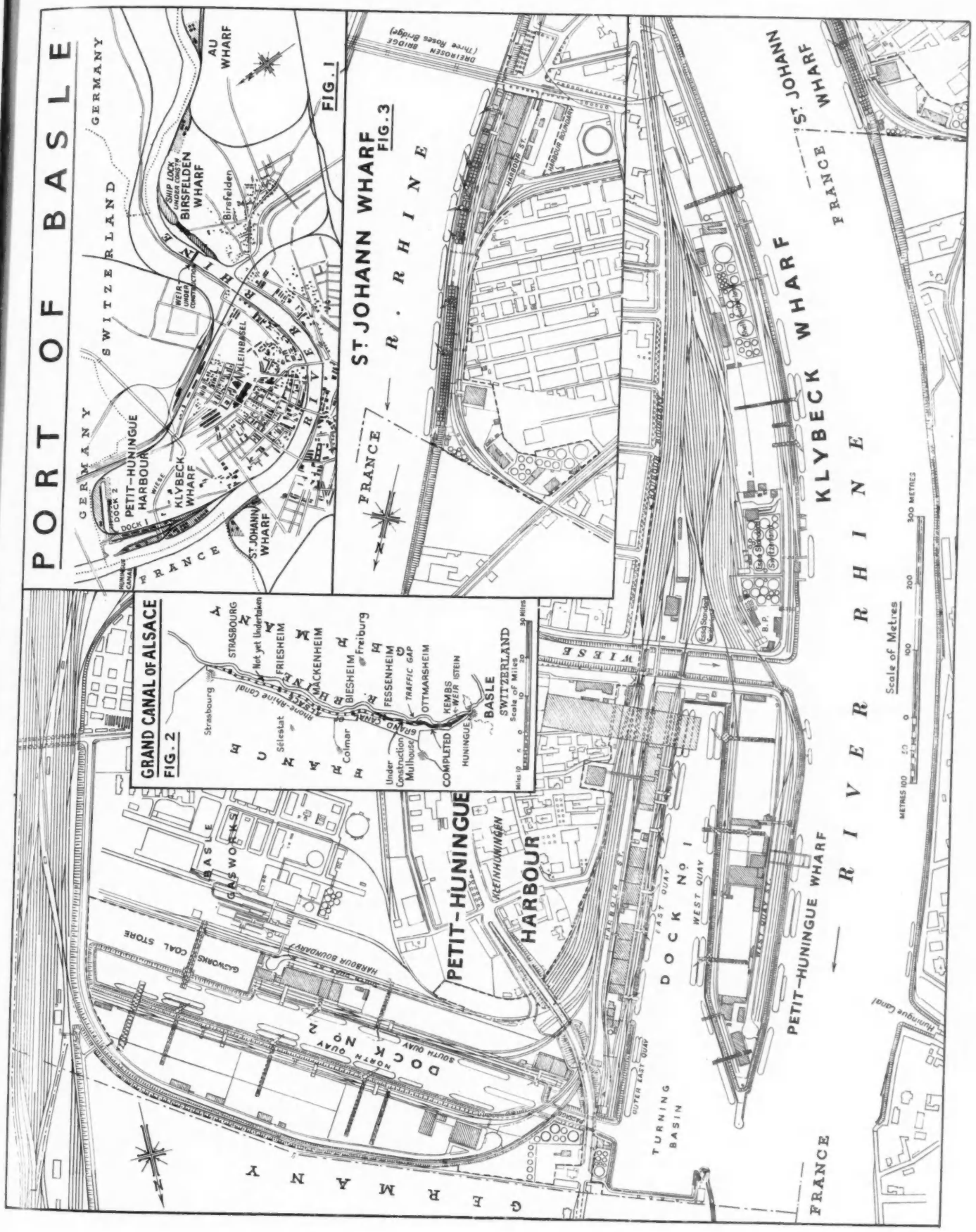
The preliminary project of a lateral canal to the Rhine (Fig. 2) to by-pass the difficult turbulent stretch from Strasburg to Basle, was designed for the Alsatian border with the aim of providing a suitable navigable waterway for the large vessels of the Rhine in all seasons, and at the same time to take advantage of the contour drop by utilising the Rhine waters for electric power generation. After much deliberation the Central Committee of the Rhine (C.C.R.) in 1909 approved of the project with the stipulation "that the canal deriving its waters from the Rhine shall be considered as an alternative navigable way to the natural Rhine course, and shall be subject to the same regulations and central control as part of the conventional Rhine as laid down in the Act of Establishment." However the Governments of Alsace and Baden, on the French and German opposing banks respectively, could not agree on a mutual working arrangement regarding the concession demanded and the whole scheme was shelved until the Treaty of Versailles in 1919. By this Treaty Article 358 assigned to France with certain reserves the exclusive right to all electric power produced by the project and the right to execute all works of control of the river that should be considered necessary for the production of electric power. Thus the old Alsatian Scheme of the lateral canal from Basle to Strasburg was resurrected and in 1921 it was submitted to the C.C.R.

After prolonged and heated debates, the scheme with several important improvements was finally approved by this body in 1925 fulfilling the conditions indicated by the Treaty of Versailles. Thus at last after almost a generation of disputation the Alsatian plan was to be realised. Broadly the essential elements were to build a barrage on the Rhine about 5 kilometres north of Basle and, slightly upstream of this, to deviate its course into a lateral canal on the Alsatian bank. This canal would be of ample cross section and depth of water to carry the largest ships of the Rhine fleets and would also serve as an elongated reservoir of Rhine waters from which to draw at convenient points, actually just below the locks separating the successive stages, the full hydraulic head values for the production of electric power.

Fig. 1. Plan of Rhine passing through Basle. The Huningue Canal, feeder arm of the Rhone-Rhine Canal, extreme left, entering river opposite main dock basins at Petit-Huningue (Kleinhuningen) on right bank. Just upstream of the river Wiese outlet lies the Klybeck Wharf on open river. On the left bank between the French-Swiss frontier and the Three Roses bridge, there is the St. Johann Wharf. Upstream, beyond the six bridges, at Birsfelden the new weir in course of construction is shown as well as the new ship locks leading to Birsfelden and Au Wharves. The docks and wharf lands are shown cross hatched. Frontiers are shown as lines of small dots.

Fig. 2. Diagram of relative layout of waterways to Basle. The towns or districts named on the Rhine indicate the sites of ship locks and electric power stations, such as Kembs, Ottmarsheim etc. The Grand Canal of Alsace follows the course of the Rhine closely and where shown in solid black represents parts completed, black with white dots indicates in construction and white with black bars flights yet to be undertaken. The flanking sloped solid lines at Ottmarsheim and Fessenheim indicate positions of restitution gaps to shunt traffic and water between river and canal. The thin line to the left from Mulhouse to Strasbourg shows the path of the Rhone-Rhine canal and from Mulhouse to Huningue the Huningue feeder arm to link up Basle with the Rhone-Rhine network of canals. It was over this relatively small canal that most of the Rhine traffic to Basle passed between the years 1923-33 owing to the difficulties of the open Rhine navigation during that period.

Fig. 3. Plan of the Rheinhafen St. Johann.


PORT OF BASLE
GERMANY
SWITZERLAND
FRANCE
BIRSFELDEN WHARF
AU WHARF
KLYBECK WHARF
PETIT-HUNINGUE HARBOUR
ST JOHANN WHARF
FIG. 1
ST JOHANN WHARF
FIG. 3
R. RHINE
GRAND CANAL OF ALSACE
FIG. 2
STRASBOURG
Not yet Undertaken
FRIESHEIM
MACKENHEIM
BIESHEIM
Freiburg
FESSENHEIM
TRAFFIC GAP
OTTMARSHEIM
KEMBS
WEIR
ISTEIN
BASLE
SWITZERLAND
Strasbourg
Selestat
Colmar
Under Construction
Mulhouse
COMPLETED
HUNINGUE
Rhone-Rhine Canal
GRAND CANAL D'ALSACE
Scale of Miles
GAS WORKS
COAL STORE
DOCK No 2
NORTH QUAY
SOUTH QUAY
HARBOUR BOUNDARY
PETIT-HUNINGUE HARBOUR
KLEINHUNINGEN
DOCK No 1
EAST QUAY
WEST QUAY
TURNING BASIN
OUTER EAST QUAY
KLYBECK WHARF
ST. JOHANN WHARF
PETIT-HUNINGUE WHARF
RIVER RHINE
WIESE
Huningue Canal
Scale of Metres
METRES 100 0 100 200 300 METRES

The Port of Basle, Switzerland—continued

The overall length from Basle to Strasburg is 114 kilometres and this was to be divided into 8 flights (later, on representations by the French, 7 flights only were agreed upon) of uninterrupted length of 16 kilometres excepting the first at Kembs of 6.5 kilometres and the final at Strasburg of 28 kilometres because of the flatter slope of the land. The mean flow of the Rhine at Basle is 1,080 cubic metres per second and it was computed to allow 50 cubic metres per second minimum discharge at the Kembs barrage.

From Kembs to Strasburg there is a total fall of 108 metres and it was estimated that with the above divisions of falls in 7 stages and the volume of water available 6.5 milliards of K W h of electric power could be comfortably produced per year—which in sum is equal to half the present production in Switzerland. The works of canalisation and power production were therefore laid out as follows:

At the downstream end of each flight the canal broadens out and divides into two arms, one forming the waiting basin leading to two shipping locks, the other pounds up into a large basin leading to the electric generating station. Beyond the locks and after a drop of about 15 metres through the turbines or the shipping locks the waters again rejoin in the next lower canal stretch. Temporarily during the construction of the successive stages the waters of the one already completed are turned back into the natural channel of the Rhine by driving a navigable cutting through the tongue of land separating the canal from the river until such time as this stage shall be also completed. Then after having served its purpose of by-passing the shipping from the Rhine to the canal in use, or vice versa, there follows the extremely delicate operation of sealing the gap. The C.C.R. had foreseen in 1925 that this changeover should be effected quickly and gave a maximum delay period of one month in the season of minimum traffic. Actually in 1947 when the gap below Kembs was made good the Contractors responsible, the E.D.F. (" l'Electricite de France ") succeeded in the remarkable effort of forming the junction of the two stages without interrupting the traffic for a single day.

In February 1952 the first vessel passed through the Ottmarsheim locks, and in the autumn of the same year the first group of electric power stations were started up. When this canal stretch was opened to navigation the C.C.R. proclaimed without qualification or reservation that the Grand Canal of Alsace was subjected to the same international regimen of navigation as the open river Rhine, notably in that which concerns dues and the consideration of all projects or works connected therewith. The work on the Fessenheim flight (3rd stage) was commenced in 1953 and will be finished in 1956-1957.

Construction Progress.

As already mentioned, whilst the construction by the E.D.F. of the canal was in progress (1928-32), the Swiss and the Germans together, with the concurrence of France, attended to the works of regularisation of the Rhine. There was a good deal of opposition to this venture: the contention was that it would unnecessarily double the expense and the function of the lateral canal. However the objectors eventually saw that the benefits to be derived from the combined works which were sound technically and were in line with the practical construction procedure of one co-operative whole, agreed to go ahead. Actually within a very short time after the completion of Kembs the arguments of the technicians were vindicated beyond expectations, and during the years up to 1939 the volume of traffic added greatly to the prosperity of Basle and the Upper Rhine.

The works were halted during the war and it was not until 1947 that the canal construction was recommenced on the second stage, Kembs to Ottmarsheim by the E.D.F. Arising from the experience gained in the early construction, and the post war improvements and requirements of modern traffic, certain modifications to the project as established in 1925, were submitted and approved by the C.C.R. in 1948 for Ottmarsheim and the third stage to Fessenheim.

The barrage across the Rhine upstream of the Istein barrier has 5 openings each 30 metres wide and they are fitted with Stoney double sluice gates.

The cross section of the canal is trapezoidal, 80 metres wide on the bed and 152 m. wide at water surface for Kembs, whereas the respective dimensions for the second and third stages are 80 m. and 131 m. The maximum velocity of flow is 1.2 m. per second and the average 0.9 m. The side banks slope at 3 to 1 and are revetted with concrete slabs. Bed aprons of concrete are covered with one metre thickness of gravel to provide anchorage for craft. The inclination of the run of the canal is 7 cm. per kilometre.

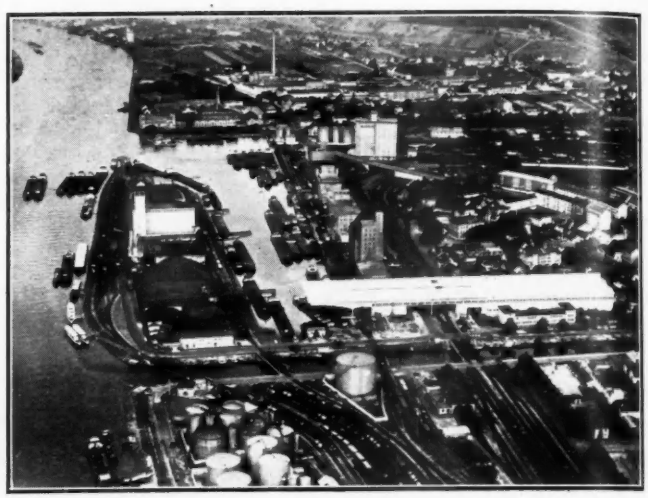


Fig. 4. Aerial view of the right bank of River Rhine at Kleinhuningen docks basin No. 1 showing the large concrete shed cantilevering over the basin covering three vessels of 1,400 tons each moored alongside. The river Wiese passes across the view in the foreground.

Fig. 5. Basin No. 1. Kleinhuningen showing discharged vessels sorting themselves out to pierce the block of traffic at the entrance. The vessels in the foreground are of 1,400 tons burthen, one the "Verbano" with diesel motors.

The locks at Kembs have the following dimensions:—

185 by 25 m. and 100 x 25 m., whereas the post war construction for the succeeding stages are now fixed at 185 x 23 m. and 185 x 12 m. They require no less than 270,000 cubic metres of concrete for construction. The upstream gates are of arched pattern and the downstream gates of the portcullis type, weighing 340-500 tons. In the smaller locks the lowering of water level by 3 metres takes one minute.

The upstream waiting basins are 1,000 x 75 m. at a depth of 3 m. whilst downstream of the locks they are 600 x 100 m. This increased width is to allow sufficient turning space for the tugs should they not be required to continue the voyage to Basle.

To appreciate the gigantic nature of these works suffice it to note that the excavation of the 16 kilometre flight from Kembs to Ott-

The Port of Basle, Switzerland—continued

marsheim amounted to 19 million cubic metres and the total cost of the stretch 28 milliards of French francs.

Organisation Problems.

It was not until after the flooding of the first flight of the Grand Canal of Alsace and the works of the Kembs in 1932 that the Rhine traffic to Basle increased considerably, but unfortunately this progress was interrupted by the World War II. Recovery on the cessation of hostilities was rapid however, and at the present day it surpasses the 4 million tons mark, of which coal, oils, cereals and metals form the greater part and amount to over 40 per cent of the total Swiss imports.

In 1938 the Swiss fleet of Rhine shipping amounted to 150,000 tons capacity and post war a programme of modernisation brought it to 260,000 tons, an increase of 73 per cent. comprising 268 motor driven vessels, 76 large lighters and 23 tugs. It is remarkable that with this augmentation of the Rhine fleets the old and established river ports have not lost any of their trade and in the case of Strasburg it appears that the city has benefited since it is mainly an export port whereas Basle is import. There are of course prob-

Fig. 6. Basin No. 2 Kleinhuningen. Gas works in left foreground and bulk storage areas behind the silos. The German-Swiss frontier follows the rear white road strip in right-hand upper diagonal across the corner.

lems that can only be solved by fair compromise between the affected parties, and to that end, in 1952 the C.C.R. called a meeting of the representatives of the interests to define the problems and to form a committee to investigate the international formulae for maintaining the prosperity and smooth operation of Rhine navigation having regard to the established freedom by the Acts of Vienna and Mannheim.

In our times when no particular measure can be taken in the cadre of economy of West Europe without causing immediate repercussions more or less direct for transport, and notably for water navigation, it was indispensable that Rhine labour should be organised in a coherent manner. There was therefore founded, notably by the representatives of the Federations or Associations of water transport workers of Germany, Belgium, France, Holland and Switzerland, "The International Union of River Navigation," which was charged with representing and safeguarding the interests of the profession on the international scale. It was also charged with the task of defining and applying a common procedure for river navigation acceptable internationally, particularly by those organisations which have, in the last few years, been constituted.

Among these the European Coal and Steel Federation was without doubt one organisation whose decisions for inland transport activity had consequences of great importance. Besides, the questions more specifically connected with the Rhine were confined to the "Consortium of the Navigation of the Rhine" of which the object was to put into effect the recommendations of the Economic Conference of the C.C.R. with a view to improving the turn-round of traffic and so to put an end to the crises which periodically occur. It was principally concerned with an equitable sharing of traffic between the shipowners and the assocations of private boatmen, and the establishment of freight, taking account of the needs of the users, which ought to be the aim of these efforts and which it is desirable to see realized, by free consent, between the interested parties.

So far the Swiss have not taken part in this Consortium although it is indisputable that the other Rhinelanders of all nationalities are unanimous that an international professional collaboration without reserve is necessary and that to put it into effect it is indispensable to establish between the governments concerned a conformity of interpretation of the principles essential to the freedom of navigation. That unity of doctrine is so much the more desirable because the problems that bear on the scheme of transport will only be solved by the progressive creation of international unity leading, inevitably, to the whole of the European waterways.

Rheinhafen beider Basle.

The Swiss are naturally proud of their only port with direct communication with sea and feel yet more satisfied with its growth in the last decade and the great contribution it has made, and continues to make, to the social economy of the country. Another and perhaps the most significant factor, so long as the Freedom of the Rhine is guaranteed, is the national feeling of being a participant on an equal footing in the advantages enjoyed by maritime countries. The pressing need for Switzerland is ample supplies of raw materials and foodstuffs at competitive prices, in other words it is a country which is ready to import large quantities of bulk materials; solid and liquid fuels, oils, coals, iron ore and feeding stuffs.

Hitherto she has been dependent upon foreign rail transport and one foreign canal system of limited capacity, which have proved costly. That transport in large vessels such as the Rhine lighters, and self-propelled vessels of 1,200 tons, reduces freight charges over long distances is indisputable, hence, as Basle lies 850 kilometres from the large seaports of the coast, Antwerp, Rotterdam, and Amsterdam it is obvious that the economic structure of Switzerland has been considerably improved by the opening up of the free Rhine into the land of its source.

The recognition and appreciation of these new advantages has induced in the Swiss Rhinelanders an eagerness to consolidate the new connection with the Rhine shipping fleets and with the well-developed canal systems of France, Germany, Belgium and Holland—particularly to the termini of the large seaports and transhipping centres for overseas traffic.

The figures below give an illuminating cross section of the Swiss Rhine Shipping and show unmistakably the wide difference between the total weights of Imports and Exports of the bulk materials coming into the country and the manufactured goods leaving it. Actually, this inequality of goods exchange is typical of Switzerland's economy; the completely or partially fabricated goods exported have a considerably higher value, weight for weight, than the bulky and heavy raw materials imported.

TRAFFIC THROUGH BASLE

Year	Bulk Imports Tons	Exports Tons	Total Tons	Percentage of Total Swiss Traffic
1904	250	220	470	0.0
1910	48,561	16,139	64,700	0.8
1917	24,544	8,559	33,103	0.6
1924	213,375	73,220	286,595	3.8
1927	654,965	84,875	739,840	8.7
1930	1,005,464	94,423	2,099,887	11.6
1935	2,149,045	67,952	2,216,997	27.7
1937	2,741,240	219,025	2,960,265	34.1
1939	1,961,805	154,127	2,115,932	22.7
1940	—	—	—	—
1942	992,547	112,930	1,105,477	22.9
1945	2,504	—	2,504	0.1
1948	2,617,862	161,404	2,779,266	29.9
1950	3,247,125	253,292	3,500,417	38.0
1951	4,240,096	352,317	4,592,413	42.1
1952	3,942,829	296,096	4,238,725	42.9
1953	3,653,743	269,328	3,923,071	41.1

The Port of Basle, Switzerland—continued

In the first place there are the solid fuels which are the backbone of the Rhine traffic and in the second place there are the hydrocarbons which have increased so rapidly that they have displaced bulk grain and fertilizers into third place. These three groups represent about 75 per cent. of the total imports to Basle.

The great increase in the development of traffic into "Rheinhafen beider Basle" as the port is known, in the last 30 years could not have been achieved without the important works of regulation of the Upper Rhine from Strasburg to Basle. These works were undertaken under a German, French, and Swiss States treaty of 1929 and were commenced in 1931. The Swiss undertook to bear 60 per cent. of the cost and the Canton of Basle 20 per cent. of this amount (or 12 per cent. of the total).

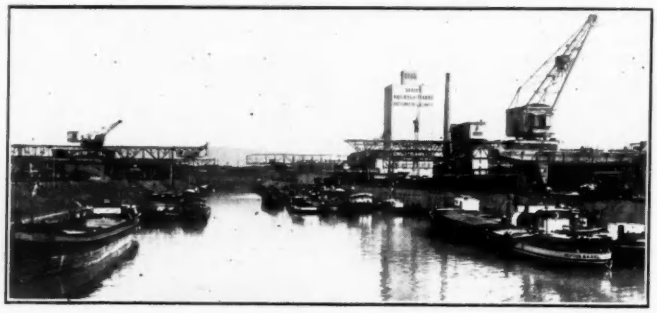


Fig. 7. Basin No. 2 looking east showing disposition of transporter cranes in different ownerships.

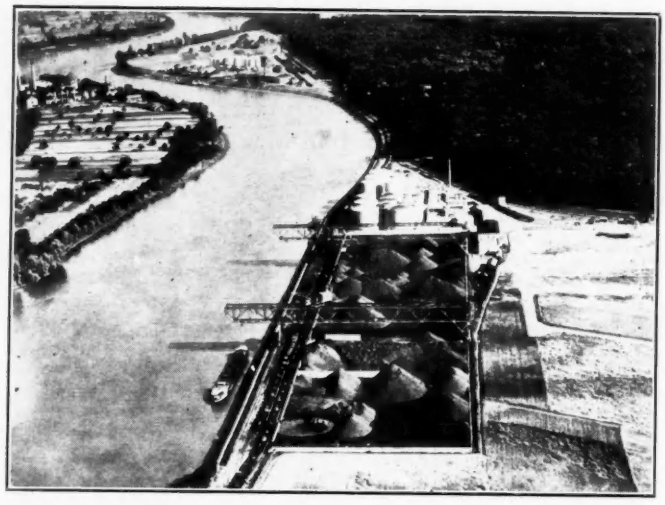


Fig. 8. Aerial view of Birsfelden bulk storage areas, in foreground are the Au tank storage area in the next bend of the Rhine, left bank, upstream. Opposite, on the right bank, is the town of Baden, in German territory.

The remarkable foresight of French engineers in the construction of the feeder branch of the Rhone-Rhine canal running from Mulhouse to Huningue (France) (Fig. 2) which enters the Rhine less than one mile below Basle (left Bank) and directly opposite the dock basins of "Petit-Huningue Harbour," carried out for seven years an invaluable service to Swiss traffic. From 1928 to 1935 the works of regularisation and the intractability of the open waters of the Upper Rhine would without this assistance have put an end to all water transport between Basle and the Rhine. Nowadays the Huningue Canal handles only 8 to 10 per cent. of Basle traffic against the 80 to 95 per cent. in the period mentioned above.

At the beginning of this century when the first towed barges succeeded in making the Rhine passage to Basle, there was great enthusiasm and optimism among the town merchants about the future commercial prospects. This led to the construction of quays and warehouses on the left bank between the Bridge of Three Roses and the French Frontier boundary. They occupied a very narrow strip of land about 50 metres wide and 550 m. long and became known as the Rheinhafen St. Johann, Figs. 3 (on Plan) and 3a.

The favourable traffic prospect after World War I decided the towns authorities to extend docking and warehouse facilities (Figs. 4 and 5). The only convenient ground space available within the boundaries of the town was a relatively small area on the right bank at Kleinhuninger which was restricted to the north and east by the Swiss/German frontier and on the south by the Rhine tributary the River Wiese. Nevertheless by re-siting the course of the latter it was possible to build No. 1 Dock of Petit-Huningue Harbour (Kleinhuningen) 740 metres long and 63-100 metres wide with a water surface area of 65,000 sq. metres Further, the Petit-Huningue Wharf and the Klybeck Wharf were constructed on the banks of the open Rhine, the former on the tongue of land 500 metres long separating the No. 1 Dock from the river and the Klybeck Wharf 650 metres long upstream from the new mouth of the river Wiese.

Then in 1936 there was commenced the construction of No. 2 Basin (Figs. 6 and 7) 695 metres long and 45 to 63 metres wide having a water surface area of 40,000 sq. metres. It runs more or less west to east, and the entrance abuts on the turning circle at the Petit-Huningue Harbour outlet to the Rhine.

Yet again War interfered with the progress of this work and also with the shipping traffic, as it had a generation before. There was however a great difference. In 1914 the traffic was 90,000 tons but in 1939 it had soared to 2,115,000 tons and was still increasing.

It was evident that the facilities for the berthing and turn-round of shipping, and shed and storage space were becoming inadequate. (About this time, 1936, there was also apparent a considerable drop in the Strasburg-Basle traffic.) It was impossible to find a suitable site or space within the boundaries of the town confined as it was by territorial frontiers. However the matter was resolved by agreement between Basle town and Basle province to site the further extensions 8 kilometres upstream of the town at Birsfelden and Au both lying on the left bank of the Rhine (Figs. 1 and 8). Work was interfered with by the outbreak of war but later resumed until eventually the Birsfelden ship-locks were completed in 1954. The agreement reached between the town and the province of Basle provided for joint ownership of all the port property and undertakings such as the port land, basins, quays, railways and railway stations. The sheds, warehouses, silos, tanks and all the handling equipment for them are privately owned by wharfingers or by firms specializing in the various branches of commerce. These buildings were constructed by the interested firms on land leased from the "Rheinhafen beider Basle" which was the new title of the port authority. The area of the port lands now owned by the latter is 1,065,000 square metres comprising also 5½ kilometres of usuable quays and 45 kilometres of railway track.

The capacity of the warehouses, sheds and silos is 243,000 tons and that of the tanks 264 million litres. There are also 40 cranes of various capacities and other suitable mechanical handling equipment.

An item of great interest is that in the last 20 years Basle has built up a Swiss Rhine and canal fleet of 378 units with a combined tonnage of 263,000 tons. It is all privately owned and serviced. It should be mentioned that the Rhine fleet comprises some of the most modern powerful motorised vessels for inland transport in the world which do credit to this new water navigation venture. The latest and largest of the new Rhine diesel tugs under the Swiss flag is the "Uri" of 3,600 h.p. The Swiss fleet handles 45 per cent. of all the Rhine traffic to Basle.

The Baslers and the Swiss merchants and manufacturers generally are particularly satisfied with the important direct saving achieved by the considerable reductions of shipping freight charges. On the basis of a traffic of 4,000,000 tons annually it is estimated that the freight bill represents a national saving of no less than 17 to 18 million Swiss francs, which previously would have gone into the pockets of foreign states. At the same time there is an equally important economy of national expenditure arising from the reduction in the need and expense of goods hauled over foreign State railways to Switzerland from the North Sea, Atlantic and Mediterranean Sea Ports. The advantages derived from these reductions

(continued at foot of following page)

The Role of the Corps of Engineers in the U.S.A.

Responsibility for Maritime and Navigation Works

By N. N. B. ORDMAN, B.Sc., A.M.I.C.E.

IN subsequent issues of this journal there will appear an extensive review of, and excerpts from, an important publication prepared by the Office of the Chief of Engineers, U.S. Army, entitled "The Hopper Dredge, Its History, Development and Operation." That a publication dealing with hopper suction dredgers (as "hopper dredges" are known in this country) should be prepared by a department of the U.S. Army, indicates that the U.S. Corps of Engineers includes in its activities a role not paralleled by its counterpart in the British Army. The extent of this role, which is not widely appreciated outside the United States, forms the subject of this introductory article; particular attention being paid to maritime works.

Federal Government Agency

The Corps of Engineers is part of the Department of the Army and as such is a constituted agency of the Federal Government. It is charged and empowered by law to administer and conduct the Federal Civil Works programme as authorised by Congress. There is no close parallel in British governmental administration, but in the United States another similar agency is the Bureau of Reclamation which has similar legal responsibility under the Department of the Interior for the conduct of the Federal Reclamation Programme.

The Department of the Army is under the control of the Secretary of the Army, who delegates much of the control, except for major financial, auditory, legal and land and estate matters, to the Chief of Engineers, the latter being the officer in charge of the Corps of Engineers.

The Corps has been engaged in carrying out civil works improvements under laws enacted by Congress for more than a century. At first the work was limited to navigation improvements in rivers and harbours. Since then it has grown until it now includes large programmes for the control, conservation and use of the waters of major river basins. In recent years the annual appropriations have run into hundreds of millions of dollars covering works in all the forty eight states and in U.S. territories and possessions overseas.

The legislative framework within which the Corps of Engineers works is somewhat unfamiliar to British readers and reflects the differences between the organisation of the U.S. Federal Agencies and Her Majesty's Civil Service Departments. The essentials of the system are however, straightforward, and may be briefly outlined. The Corps has no broad general authority to undertake construction of major projects under its own initiative. The Secretary of the Army is authorised and directed to cause preliminary examinations and surveys to be made under the supervision of the Chief of Engineers. These reports are referred to the Board of Engineers for Rivers and Harbours for consideration and recommendation and subsequent review pursuant to resolutions of the Senate or House of Representatives Committee on Public Works. Projects are also authorised by specific acts of Congress.

The division of the United States government into the legislature and the administration, the latter headed by the President, represents, of course, a major difference as between the American and British systems of government. The Corps of Engineers, in its administration of the Civil Works Programme, has certain responsibilities to both branches of government. Direct relationship with, and control by the President is normally exercised through the Bureau of the Budget, which is part of the Executive Office of the President. This Bureau reviews reports, recommendations and requests for appropriations by the Corps, and establishes the relationship of the Corps' recommendations to the President's programme.

A submission by the Corps to Congress may not be in accord with this programme, but the submission will nevertheless be conveyed to Congress with this fact noted. In addition, as an agency of the Executive Branch of the Government, the Corps must administer the Civil Works programme in accordance with direct instructions from the President in various matters and on projects involving broad policy questions.

Federal Navigation Programme

Within this organisation framework the Corps of Engineers administers the Civil Works Programme, part of which is the Federal Navigation Programme, under which the Corps is responsible for providing, operating and improving the navigable waterways of the United States. This programme has now been in operation for over 130 years and has produced the most excellent and extensive system of harbours, channels and inland waterways upon which much of America's pre-eminence as a commercial power is based. The current river and harbour programme is estimated to cost over six and a half thousand million dollars and is summarised as follows:—

Status	Number of Authorisations.	New work in millions of dollars. Estimated Federal Cost	Funds Appropriated up to and including 1952.	Funds Required to complete.
Completed	1,721	914.7	859.2	55.5
Under Construction:				
In operation	155	1,367.8	1,052.9	314.9
Not yet in Operation	34	1,171.4	271.1	900.3
Authorised, not started	369	3,174.1	12.2	3,161.9
Total	2,279	6,628.0	2,195.4	4,432.6

As an indication of its extent, the number of commercial ports included in the programme is 131 on the Great Lakes and 266 coastal, including off shore islands such as Hawaii, making a total of 397. About 28,600 miles of inland waterways have been Federally improved and the programme includes the maintenance of 312 locks and 219 navigation dams.

Of particular interest to readers in countries where much of the work of the Corps of Engineers is executed by Port Authorities and

The Port of Basle, Switzerland—*continued*

have enabled the Swiss manufacturers to compete on a more equal level with neighbouring countries and thus share in the benefits of a wider market for Swiss export goods. Besides these direct economies one must not forget that the development of the Basle port gives a new source of employment to 1,700 dockers, stevedores, crane drivers, tallymen, etc., as well as several hundred men employed on the Rhine fleet of large motorised units. Again the port has attracted a large amount of motor lorry traffic bringing, and taking for distribution, heavy loads of goods. In other words as Basle dock traffic increases so does the inland demand manifest itself.

Both World wars found the Swiss at a great disadvantage not only for the necessaries of life but also for all manner of imported goods requisite for national well-being and internal economy. There was little or no storage in the country and the nation depended entirely upon the storage in foreign sea ports. Now this is changed, for Basle will provide the silos, tanks, and storage space for those goods, contingent against any future political crisis about her frontiers.

Under peace conditions the future of the Basle port is exceedingly favourable and even greater expansion is fore-shadowed. There is one point however regarding the future that will require careful and patient diplomatic handling and that is the obligation of the Swiss to give the same open Rhine facilities through Switzerland as has been accorded to her through her neighbours' territories. R.R.M.

Role of the Corps of Engineers in the U.S.A.—continued

other local or regional bodies, is the extent of the co-operation and contributions by local interests in the United States to these Federal projects. These are considerable and are always present. In general the law requires that they depend on the extent to which local interests will benefit from the improvements. Thus local interests participate by contributing funds where warranted, furnishing lands, easements and rights of way, without cost to the Federal Government, providing and maintaining adequate terminal and transfer facilities open to all on equal terms, maintaining berthing areas and approaches to docks, executing without cost to the Federal Government, alterations and maintenance to services and public utilities which may be affected, and to highways and bridges etc.

In some cases, however, where the local interests derive very little benefit, even although the project is large, no local participation is required.

Referring back to the definition, given above, of the Federal Navigation Programme, it will be seen that this is restricted to "navigable" waterways. The term "navigable waterways of the United States" is not defined by statute and hence must be determined by judicial proceedings. Congress may declare a stream non-navigable and thereby abandon Federal jurisdiction, but a non-navigable stream may not be declared navigable by statute. Tests of navigability have been laid down by statute

Coast and Harbour Engineering

Narrowing the scope of our review still further, we come to coast and harbour engineering, which covers the investigation, design, construction and operation of improvement and protection works on coasts and in harbours, and which forms an important part of the work of the Corps of Engineers. The construction, maintenance and operation of navigation channels, establishment and maintenance of harbour and pierhead building lines, designation of anchorage areas, establishment and administration of Federal regulations governing navigable waters, are responsibilities of District Engineers, who are also the field agents of the Beach Erosion Board in making investigations and studies of local erosion and protection problems, usually in co-operation with State and local agencies. The District Engineers are also responsible for construction work where this is carried out on public lands. Piers, quays, vessel landings and cargo unloading structures in harbours are planned and built by local and private interests but within lines laid down by the Corps of Engineers.

As explained earlier, authority for regulation, investigation, construction, operation and maintenance with regard to navigable waters, derives from Congress, generally in the form of River and Harbour Acts. Regulations under the authority of these acts are established by the Chief of Engineers and the Secretary of the Army. Most River and Harbour Acts relate to specific projects, but some general policies have been laid down.

The powers of the Chief of Engineers and the Secretary of the Army, established under various enactments, include:—

1. the approval of locations and plans for any bridge, dam, dyke, or causeway in navigable waters in the United States.
2. the approval of the construction of any structure outside established lines, or where no such lines have been established, the prohibition of excavation or filling, or altering the course, location, capacity, etc., of navigable waters.
3. the establishment of building lines beyond which piers, wharves, etc., may not be built.
4. powers relating to the discharge of refuse matter, sewage and oil from vessels.
5. regulating the anchoring of vessels.
6. enforcement of regulations.
7. alteration of bridges found to obstruct navigation.
8. removal of wrecks.
9. prescription of navigation regulations.

It will be seen that these, powers (and the above list is not exhaustive) include many of those exercised in the United Kingdom by the various Dock and Harbour Authorities in relation to the port or ports under their control.

The administration of these powers and the execution of the construction and maintenance of coast and harbour projects are carried out by District and Division engineers under the direction of the Chief of Engineers. There are nine divisions and twenty-four districts. The work of a district engineer will thus include investigations into river and harbour improvements, beach erosion and protection problems, channel surveys, construction of channels, jetties, breakwaters and shore protection works, removal of wrecks, the administration of navigation laws, etc.

Dredging

A large part of these responsibilities relate to the creation, improvement and conservation of navigable channels. The extent of the works of this type carried out by the Corps of Engineers is so large that the Corps must be the largest single operator of dredging equipment in the world. Because of the great majority of dredging carried out by the Corps has been in comparatively soft material, and for other reasons, the suction dredger has been developed rather than the ladder bucket types more common in British and European practice. This development has been comprehensively documented in a report prepared by the Office of the Chief of Engineers under the direction of the Hopper Dredge Board, which will be reviewed in subsequent articles.

Port Publicity

The Work of the Public Relations Department

(Specially Contributed)

Dock and harbour authorities have like all other industries found it necessary to advertise in the press, to be represented at exhibitions and trade fairs, and by various other means to disseminate information concerning their undertakings. Development of world trade and increasing competition has in recent times led to an intensification of this effort and for the past quarter of a century such work has been known as "public relations." Webster defines "public relations" as "The activities of a corporation, union, government, or other organisation in building and maintaining sound and productive relations with special publics such as customers, employees, or stockholders, and with the public at large, so as to adapt itself to its environment and interpret itself to society." An American publicist has defined "public relations" as "The management function that evaluates public attitudes, identifies the policies and procedures of an individual or an organisation with the public interest, and executes a programme of action to earn public understanding and acceptance." The Institute of Public Relations (United Kingdom) has a simpler definition—"The deliberate, planned and sustained effort to establish and maintain mutual understanding between an organisation and its public."

From the foregoing definitions it will be seen that some assessment must be made of the users' attitude towards the port's policy. There are a number of ways in which this may be done. At the highest level, representatives of shipping, importing, exporting and local transport are quite likely to have direct representation on the governing body and these members will be able to discuss the user reaction direct with their colleagues. Management can also make assessments from the representations of local Chambers of Commerce and other trade organisations, while the Public Relations Officer can obtain a more general picture from the press cuttings he receives or from what is broadcast.

It will be noted that reference has so far been only to "public relations," but this term must serve to include advertising, press relations, publicity, information services, and even a new term, customer relations.

Advertising by ports is designed to attract trade—both shipping and goods. The former will, of course, bring the latter, and the warehousing of goods is always renumerative. Such advertising is confined in the main to publications which are read by primary producers, shippers, shipping companies, and shipping and forwarding agents. Advertising is also directed towards importers and exporters of all commodities but especially of those commodities in which a port may specialise due to old established custom, proximity to a great market, or the availability of special

Port Publicity—continued

facilities. Smaller ports whose advertising is restricted may deal with their advertising themselves, but larger ports usually employ an advertising agent who is in a position to advise them on circulation, and who will buy space and prepare, in co-operation with the port, copy and layout for the advertisements. There are also occasions such as a jubilee, or the opening of a new dock where a prestige advertisement in national newspapers adds to the dignity of a port's relations with its public. The larger ports of a country in their advertising and exhibition work have to bear in mind that they are national institutions and therefore their publicity work must be restrained and dignified.

With the exception of the technical publications the press as a whole has a lamentable lack of knowledge of what goes on in ports. Generally speaking, docks and harbours are divorced from the towns which they serve, and many of their activities are hidden from press and public by customs fences and bonded warehouses. Some, but few, newspapers have shipping correspondents who can be relied upon to give accurate reports, but the majority of newspapermen have but a sketchy knowledge of the operation of tides, lock gates, and dry docks. To the majority a liner is a very large passenger ship as opposed to a "dirty" tramp, and tugs going about their lawful occasions are invariably referred to as "fussy." It will be seen, therefore, that the efforts of a Port Press Officer must be unremitting in attempting to guide reporters into the realms of actuality. An occasional press conference for a specific purpose such as announcing a development scheme at which press representatives can ask questions at a high level is an important aspect of this liaison work.

Officially, many editors despise hand-outs from Press Officers but these hand-outs contain accurate information and the correct technical terms from which the story can be written up according to the newspaper's particular requirements. In any case the editor of a newspaper can always, if in doubt, quote "according to a spokesman of the port."

Newspapers being what they are in catering for what the public is alleged to want are always on the look-out for a "human" story rather than something factual about shipping and commerce.

Apart from news items in the press much information can be disseminated through the medium of feature articles in daily, weekly, and monthly publications. Often these are written by staff or free-lance journalists who prepare their material after a visit to the quays and the collection of information from the port office. Sometimes these feature articles are supplied by a member of the port's staff.

Another aspect of the printed word as a means of publicising a port is the issue by a port of its own publications. Commonest among these are the house magazines, good examples of which are those issued by Sydney (N.S.W.) and London. Many ports issue tide tables and maps, usually including some statistical or factual information. Yet another and more indirect method is employed by The Delaware River Port Authority who distribute coloured reproductions of advertisements of industrial concerns in their area in advance of their publication in national weeklies. These advertisements include a reference to "America's fast-growing seaport" serving the area in which the industry is located. Most of the larger ports issue from time to time comprehensive handbooks for limited distribution. One such publication is issued by Göteborg and is well illustrated and has an edition in English. In some instances publishers of local guides include information supplied by the port.

Ships are photogenic and many fine pictures of ships in harbour have been published. Often a famous liner is associated with a particular port (e.g.) the "Gothic," London; the "Queen Elizabeth," Southampton; and the "United States," New York. A photograph of one of these vessels brings indirect publicity to the port concerned. Photographs of dock warehouses and transit sheds have little interest to the general public unless they are stacked high with some cargo which is in the news. Dock discharging scenes are often "still life" as the dockers like to pose for the photograph instead of carrying on with the job and thus provide an action picture. A good library of both copyright and non-copyright photographs provides a port not only with a record, but puts it in a position to supply the press with illustrations at short notice. Newspapers usually prefer to seek permission to take their own photographs but generally speaking magazines rely on what the port can provide, and naturally prefer to borrow a block of a non-copyright photograph if one is available.

Film Publicity.

Film strips with suitable teaching notes are popular with schools and may be supplied on loan by the port. They may also be hired from one of the companies which has made such strips in collaboration with the port. Lantern slides have by no means been superseded by films or film strips as, being independent pictures, they may be arranged in any required order. The new small coloured slide is gradually superseding the larger black and white slide and is popular with cultural societies who include lectures in their programmes. When it comes to films the question of expense needs serious consideration. There is a vast difference in the cost of a 16 mm. black and white silent film and a 35 mm. colour sound film of the same running time. There is a big demand for films. A good port film may at the outset be booked for commercial showing in cinemas after which there will be a steady demand for a 16 mm. edition on loan. Unfortunately films soon become dated: ships featured in them may change hands and alter their house colours, or they may be scrapped. Quays and lock entrances may be rebuilt, or, worst of all, the dresses of any ladies who may have happened to be in the film will have changed in fashion. Some ports maintain their own film unit but excellent as they may be, they have their limitations and cannot hope to compete with films produced by the industry with all its ramifications. The port film unit can, however, be used most successfully for technical purposes such as illustrating the progress of constructional work, or methods employed in handling cargo. Such films are of great value to students and trainees. Occasionally a film company will need to use dock scenes for a background to a drama and here a port authority needs to be very wary for after going to endless trouble in arranging for police, canteen, first aid, and other facilities the results may be disappointing. "In Clouded Yellow," for example, the audience is led to believe that a dramatic scene is being enacted at Liverpool but a close study of the picture will show that it suddenly switches to dock sheds in London. In "The Man from Toronto" a departure from Southampton was screened but the filming was done in the studio from enlarged "stills" taken at Tilbury. In granting facilities to a film company to work in the docks it is advisable to insist on an indemnity being signed as so few people outside the industry realise that docks are dangerous places in which to take chances.

Lecture and Broadcast.

Mention has already been made of lectures by means of using film strips and lantern slides as visual aids. These lectures may be given by a member of the society borrowing the film strip or slides with the accompanying notes, or by a member of the port's staff. Apart from the "general" audiences provided by these societies are the more important audiences of Service Clubs, such as Rotary. Here, in a matter of twenty minutes or so the port's representative has an opportunity of telling a selected audience of business men about his port and for five minutes or so answering questions which are usually very much to the point.

Broadcasting provides plenty of scope for publicising a port. Items of international, national and regional interest may well be included in a news bulletin. The radio is as good a medium as the printed word for a feature provided the interest can be maintained. It must, however, be borne in mind that its value is of a transitory nature compared with the more lasting printed word. Gradually television is superseding radio and here the ports have the advantage over so many other industries in that whatever story they have to tell the possibilities of simultaneous illustration are almost without limit.

The development of commercial television in the United Kingdom opens up new fields in public relations work. Will port authorities be likely to pay the high fees for their own programmes or are other advertisers likely to use port scenes to focus attention on their products? At this stage of its development it is not possible to express an opinion.

Exhibitions and trade Fairs provide an opportunity of bringing a port to the public and in the course of an exhibition of two

Port Publicity—continued

weeks' duration from one half to one million members of the general public are likely to learn something of a port's activities from the models, plans, and photographs displayed. Trade fairs have not such a large attendance as exhibitions but they provide a temporary headquarters for the port's representative among hundreds of exhibitors who are potential importers and exporters. At the First United States International Trade Fair held in Chicago in 1950 no less than twelve European and American ports had stands. These were grouped together in one section of the exhibition hall and competition for all types of publicity was keen, especially between rival American ports. At a trade fair such as the British Industries Fair at Birmingham a port has 1,000 potential clients under one roof at the same time.

While exhibitions and trade fairs provide occasional opportunities for port representatives to canvass for business some ports maintain permanent representatives in key centres in their own countries and abroad. London has representatives in Sydney (N.S.W.) and in Cape Town. New York has a Port Promotion Office in Chicago; San Francisco has an office in London; and Seattle has agencies throughout the United States and the Far East. Göteborg has an exhibition in railway coaches which tours Swedish cities.

Facilities for visiting ports vary considerably. Many of the small ports have open access to the quays while prohibiting access to the bonded warehouses and sheds. At most times ports are open to accredited visitors, particularly officials of other ports and in some of the bigger ports arrangements are made for the general public to visit the docks by launch. This is, of course, preferable to having large numbers of the public straggling along the quayside over railway lines and under cranes, a source of accident, and even perhaps indulging in petty pilferage. London specialises in launch visits by organised parties of school-children for whom they are school journeys. A running commentary by an official of the port enhances the educational value of these visits.

Teachers, and particularly students at teachers' training colleges, are constantly seeking information regarding ports for the preparation of a lesson or the writing of a thesis. While this is an admirable thirst for knowledge many of the applicants tend to rely on the Public Relations Officer supplying them with every scrap of information much of which is available in standard works in public reference libraries. Occasionally an enterprising teacher will ask for dock plans from which the class will construct a scale model complete with cranes and ships, featuring perhaps the vessel in which they are particularly interested through the Ship Adoption Society. At a higher level one might mention the excellent model of the Avonmouth Docks in possession of the Port of Bristol Authority which was constructed in the Bristol School of Art.

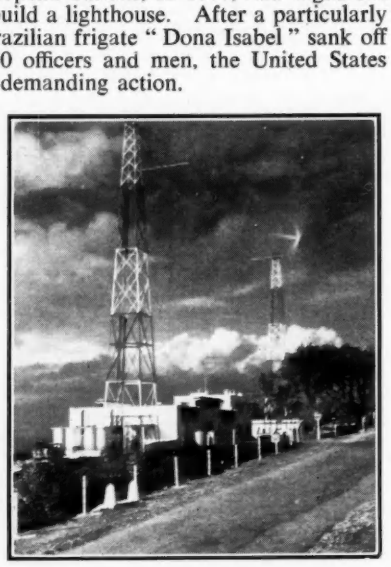
Cape Spartel Signal Station

Turbulent History of International Installation

By M. BULL.

In 1892 Lloyds built and installed a semaphore near Cape Spartel lighthouse, at the western entrance to the Straits of Gibraltar. This part of the rocky coast of Morocco, now the International Zone of Tangier, had been the scene of so many shipwrecks that several European nations, in 1860, had urged the Shereefian Government to build a lighthouse. After a particularly bad shipwreck, when the Brazilian frigate "Dona Isabel" sank off Spartel with the lost of 250 officers and men, the United States joined the other nations in demanding action.

Morocco was then in a state of anarchy, and all Europeans were looked upon with suspicion. However, after prolonged negotiations, the Sultan's Government finally gave permission for the lighthouse to be built, and undertook all expenses. Cape Spartel lighthouse was built under the direction of a French engineer, Monsieur Jacquet of the Paris "Services des Phares." This lighthouse, the only international one in the world, is administered by a commission of twelve Powers, of which Great Britain, France, Spain and the U.S.A. are members. Each year, the Consuls General of these nations meet in Tangier to discuss the budget, expenses and maintenance. Last year, each of the twelve nations contributed the sum of Frs. 750,000 to the lighthouse's upkeep. The beacon was first lit on October 15, 1864, and had a fixed light of twenty thousand candle-power.



The wireless beacon transmitter at Cape Spartel.

Then in 1892, four hundred yards away, Lloyds, by agreement with the twelve nation commission, built the signal station. An Englishman, Mr. Hathaway, lived there alone, in sole charge, with some Moorish servants. During the day he flagged the ships entering the Straits of Gibraltar, and at night signalled them with a hand lamp. An overhead land line joined the signal station to the Eastern Telegraph Co. office in Tangier, eight miles away. Over this line, Mr. Hathaway sent, in Morse, the ships' names, destination and messages to their owners. The Eastern Telegraph Company then relayed the information by cable to Lloyds in London.

Despite the isolation of the signal station—in those days it was separated from the town by eight miles of wild scrub-covered hills, with no roads and hostile natives—the Englishman seemed to enjoy his work. From time to time he would ride into Tangier to visit friends, at other times English people from the E.T.C. would go out and spend a day with him.

Then came the 1914 war. Although the lighthouse had once been attacked by a band of Moors from a nearby village, angry at the intrusion of Europeans and a light that prevented ships from going ashore and being looted, the Semaphore had not been molested. But at the beginning of the First World War the villagers, incited by German agents, suddenly attacked it one night. From behind bolted doors and barred windows, the Englishman and his servants fought off the attack. Shots were fired on both sides, Mr. Hathaway being slightly wounded in the head. The land line was cut, however, and the Signal Station remained closed for the rest of the war.

When peace came again, Lloyds re-opened the Station and Mr. Hathaway returned from England to his old post. Until 1933 the Station continued communicating with ships by morse, but by 1933 most ships were equipped with wireless, so that the station was no longer necessary.

On August 1st, 1933, the International Commission of the lighthouse, in agreement with the Shereefian Government, installed a powerful fog horn. In 1937 the signal station was rebuilt and a wireless beacon transmitter was installed. When the Spanish unexpectedly occupied Tangier for four years during the last war, they occupied Cape Spartel lighthouse too, and for some obscure reason they shut down the wireless beacon. In 1945, on the conclusion of hostilities, the transmitter was started again, but because the apparatus had seriously deteriorated, it was once more closed down.

In 1952, the wireless transmitter station was entirely rebuilt by the Shereefian Government and a much more powerful beacon of two kilowatts was installed. This transmits the morse letters S.P. every thirty minutes in fine weather, and every six minutes during fog.

Coal Shipping on Tyneside

Description of New Bulk Handling Facilities

By ROLT HAMMOND, A.C.G.I., A.M.I.C.E.

FOR more than six centuries coal has been shipped from the River Tyne, which is one of the most important shipping points for the mineral in Great Britain.

Responsibility for providing bulk handling facilities rests with the Tyne Improvement Commission, whose latest installation at Whitehill Point, North Shields, embodies several revolutionary ideas and is likely to influence design and construction of this type of plant for many years to come. The "staith" (a local word which means an elevated gantry or roadway from which coal is loaded into colliers) has for a long time been the only equipment for coal shipping in that part of the country.

Four of the existing gravity staiths on Tyneside were found to be in need of replacement and new coal shipping facilities were essential. After considerable study, the conclusion was reached that the proposed new plant at Whitehill Point would have to be capable of shipping at least 750,000 tons of coal every year, their types ranging from dry duff and filter cake to "run of mine." In addition, the plant had to be capable of handling a wide variety of railway wagons, the smallest having a capacity of 10 tons and a tare weight of 6 tons, corresponding figures for the largest size being a capacity of 24½ tons and a tare weight of about 11 tons.

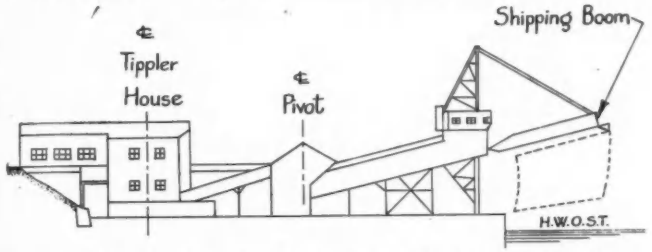


Fig. 1. Side elevation of coal shipping plant, showing one of the shipping plants; working range diagram is shown dotted.

This plant has to be capable of bunkering ships as well as loading colliers both for coastal and export coal trade. In deciding the design of loader, it was specified that the equipment must be capable of loading coal in bulk from the face line of the quay to 60-ft. beyond that line, and in the vertical sense from 5-ft. to 60-ft. above H.W.O.S.T. Long experience of coal shipping, more particularly in frosty weather, proved that where washed coal had to be handled, such material would not flow by gravity through the bottom or end doors of railway wagons. In order to ensure speedy coal handling under all weather conditions, and to maintain a high rate of turn round for shipping, it was laid down that rotary wagon tipplers should be employed, each capable of handling 500 tons of coal per hour; the installation, equipped with two tipplers and two telescopic shipping booms on radial towers, is thus capable of shipping 1,000 tons of coal hourly.

The coal-loading berth has a length of 590-ft., and provides 30-ft. of water at L.W.O.S.T. It has been equipped with an energy-absorbing fendering system of the most modern design along the face of the concrete structure. The spring elements comprise large cylindrical rubber blocks positioned at 12-ft. 6-in. centres to absorb by compression the normal impact given by a ship during berthing, lateral movement of the horizontal timber fendering being restrained by adjustable chains fixed at an angle of about 45 degrees to the face of the quay. Fendering consists of a continuous horizontal timber beam 28-in. wide and 14-in. high supported by pairs of timber piles located at 12-ft. 6-in. centres.

The reinforced concrete deck of the quay is 3-ft. thick, and in itself provides adequate fixation for the tops of the piles, with the result that no additional cross bracing is necessary and the design is therefore extremely economical. In order that the structural steel towers carrying the coal shipping booms shall have a completely rigid foundation, two roads 20-ft. wide under the radial conveyor galleries have been strengthened so that they act as reinforced concrete struts. The latter are connections between the quay and the foundation of the pivot houses, which embodies thrust walls strong enough to transmit heavy impact loads to the underlying solid ground.

Access to the new quay includes a reinforced concrete road and a double-line railway on the river wall behind the pivot houses; the general arrangement of the plant can be appreciated from Figs. 1 and 2, showing plan and elevation respectively. There are eight full standage railway sidings serving the plant, together with two full-wagon approach lines each about 20 yards long, laid to take mixed trains of coal wagons awaiting shipment. Four further sidings have been provided to receive and marshal empty wagons after they have been tippled and passed through the plant.

Each of the two radial coal-shipping gantries is inclined at an angle of 16 degrees with the horizontal and is able to deliver coal

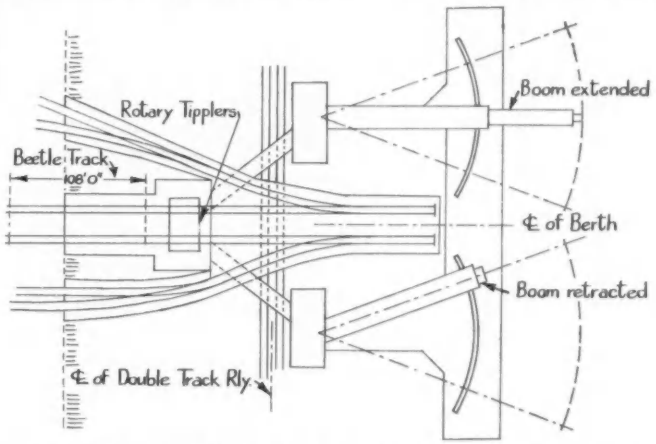


Fig. 2. Plan of Whitehill Point coal shipping plant, showing radial towers in central and extreme positions, arrangement of kick-back sidings and position of rotary tipplers.

to a height of 60-ft. above H.W.O.S.T. These gantries are supported on substantial pivots at their landward ends and the tower structures are traversed along segmental tracks set in the concrete of the quay. There are two rotary tipplers in the tippler house, each capable of rotating a loaded railway wagon, up to a maximum weight of 35 tons, through an angle of 170 degrees. The time of a complete cycle, including time taken to move out an empty wagon and to locate a loaded wagon in its place on the tippler, is only 70 seconds; the author recorded a time of only 65 secs. for the cycle. This time of 70 secs. corresponds to 50 of the 10-ton wagons every hour, thereby maintaining a feed of 500 tons of coal an hour to the conveyor belts. With the larger wagons it is not necessary to maintain such a high rate of marshalling.

The tipplers (Fig. 3) designed and made by Strachan and Henshaw, Ltd., are operated electrically and work in conjunction with suitably arranged limit switches and interlocking devices; thus, the tippler cannot operate unless a treadle switch has been depressed by the rear wheel of a wagon located on the table of the tippler. This makes certain that the wagon has been accurately centred within the rings of the tippler before it can be unloaded into the storage hopper at the base of the tippler house. A photo-electric cell relay, the beam of which is broken by a wagon as it enters the tippler, will also put the latter temporarily out of action.

The storage hopper, into which each wagon is discharged, has wearing plates of steel, which can be renewed, and a power-operated sliding gate in its base, from which coal issues to the first conveyor belt by way of a radial jigging chute. This belt delivers

Coal Shipping on Tyneside—continued

the stream of coal to the transfer point in the pivot house, where a second radial jigging chute passes coal to the shipping belt housed in the radial shipping gantry. The radial-jigging chute in the tippler house is self-jamming, with the result that no spillage of coal occurs if the hopper is full when the chute is stationary. Variable speed control of the driving motor allows a range of jigger speeds to be selected, so that rate of feeding the coal stream to the belt can be adjusted to the required capacity. By providing a sliding gate in the outlet of the hopper, slight alterations of feed can be made with minimum trouble.

There is a continuous conveyor belt in the shipping gantry, with an arrangement of pulleys allowing for movement "in-and-out" of a shuttle carrying troughing sets equipped with rubber-covered

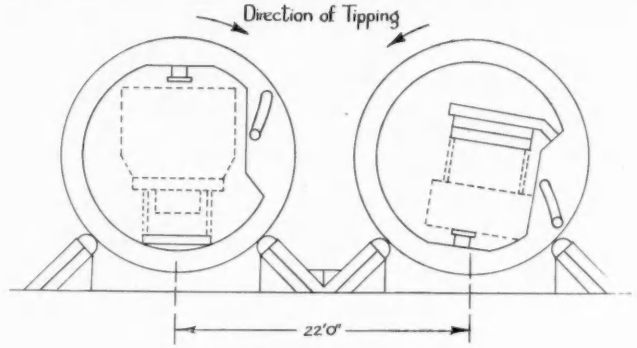


Fig. 3. Tipplers, showing in dotted outline a 35-ton wagon on the left and a 10-ton wagon on the right, respectively.

rollers. The first section of the conveyor is fixed, housed in the upper part of the gantry and half-way along this the coal is discharged to the belt supported by the shuttle in the lower section of the gantry. The moving shuttle is normally stowed beneath the fixed part of the conveyor, and can be moved up the gantry, together with the telescopic shipping boom, hinged to the forward end of the shuttle. The two driving pulleys are coupled by spur gears and driven through worm reduction gear box and fluid coupling by a motor of 55 horse power. At the hinge point between shuttle and boom there is a flat-faced pulley of 18-in. diameter acting as a diverter. Any tendency for coal to be thrown off the belt, when the angle between shuttle and boom approaches its maximum, is controlled by fixed deflector plates.

The end of the shipping boom is equipped with a specially designed delivery chute which can be swivelled horizontally through a full circle. This operation is done simply and rapidly by ropes reaching the deck of the vessel being loaded, and is a very flexible method of trimming holds. This chute is supported in the horizontal position in a frame carried on the same shaft as the head pulley of the boom, and the level luffing wire ropes are fitted in such a manner that the delivery chute will always remain horizontal. There is a walkway on each side of the shipping gantry conveyor to provide easy access for inspection or repair. All rollers of the troughing sets can be greased from one side and all grease nipples are arranged on a common plate.

An interesting feature is the spring-loaded scraper fitted at driving and head pulleys. This scraper is of hardened and tempered steel, ground to conform to the profile of the pulley, and lightly pressed against it by compression springs. A weighted scraper near the head pulley of the boom removes small wet particles of coal from the belt. A gravity take-up is fitted to the shipping conveyor, located at the tail end of the fixed section; a screw tensioning device is used on the fixed inclined conveyor.

Each conveyor belt is capable of taking a normal discharge of 500 tons per hour of coal; it is covered with rubber, is 3-ft. 6-in. wide and travels at a speed of about 400-ft. per minute to give this output. All belts are made endless on site by a vulcanising process.

Since a high proportion of wet coal is handled by this plant, special arrangements have been made for collecting the slurry. There are two tanks in the tippler house, one at the lower end of each fixed inclined conveyor, and slurry from the carrying side of the belt is scraped off at the tail pulley, collecting in these tanks. A collecting tray is also provided near the head of the fixed inclined conveyors, in order that slurry removed from the belt can drain from the trays through a fixed spillway leading to the tanks in the tippler house.

In order to maintain the desired loading rate, the marshalling and tippling cycle is limited to 70 seconds, and therefore the wagons must pass in a steady stream to and from the tippler house. This is achieved by providing gantries for the empty-wagon sidings in the form of a kick-back, so that empty wagons can run to the sidings which are at a lower level. The gantries have buffer stops and an electric capstan for moving wagons with sticky axle boxes. After having been unloaded in the tippler, an empty wagon runs down a slope of 1 in 18, passes over the turn-out and reverses on a final slope of 1 in 11, thereafter passing through spring-operated points to the sidings for empty wagons under the control of a bank rider. These gradients have been very nicely calculated, because free running wagons stop 2-ft. short of the buffers and slower running wagons always run well clear of the turn-out.

Marshalling of the loaded coal wagons is under the control of one man, and two revolutionary devices are employed to achieve this desirable end, namely: the beetle and the charger. The beetle (Fig. 4) is a new device for marshalling wagons. It runs under them and the standard design exerts a propulsive force of 5 tons, adequate to move a train weighing 400 tons on level track. It can operate with equal ease on either straight or curved track, and only the treads of the wagon wheels are touched; in addition, it can be engaged with any pair of wheels in any part of a rake of wagons. Speed of haulage depends upon the power exerted by the operating winch, but it normally ranges from 30 to 150-ft.

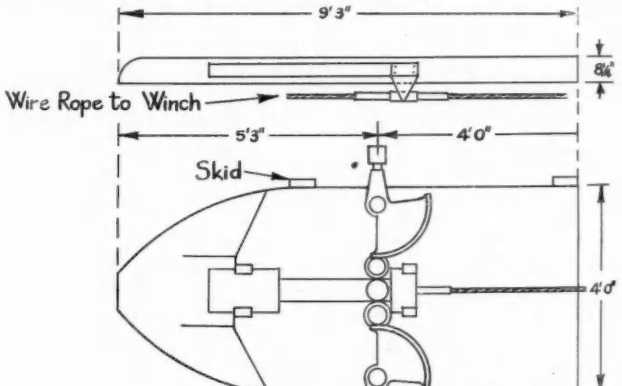


Fig. 4. Beetle with rollers extended, ready to push a rake of wagons into a position where the charger can push individual wagons to the tippler for discharge into the hopper of the coal shipping plant.

per minute. There are no loose ropes and the beetle, charger and rotary tipplers are controlled at a central point by push buttons, so that one operator is responsible for all movements.

So far as the author is aware, this is the first time that one man has been able to control the reception, unloading in tipplers and despatch of a train of loaded coal wagons. The beetle runs on four skids supported by rails, the resistance of these skids to movement being considerably greater than that of the roller arms attached to quadrants and moved outwards by a simple rack mechanism; the quadrants therefore start to move outwards before the beetle moves along its track. When the operating rope is pulled forwards, the roller arms at once extend from the sides of the beetle and are then in the correct position for propelling a train forward so that individual wagons can be pushed to the tippler by the charger. Conversely, if the operating rope is pulled in the reverse direction, the roller arms will be retracted before the beetle moves, after which it will be hauled backwards under the wagons and completely free of them, ready to deal with another train.

Coal Shipping on Tyneside—continued

The charger (Fig. 5) is another highly ingenious yet very simple device, running on its own pair of rails outside the main track and propelled by a rack-and-pinion mechanism. The ram of the charger is articulated to permit freedom of movement where the rail track starts a down-gradient of 1 in 36 to the tippler. The arms on which each roller of the charger is mounted are extended by a pedal which the operator depresses, so that the rollers are engaged in front of and behind the tread of the rear wheel of the leading wagon of the train; the charger now has complete control of this wagon.

At the start of a cycle, the tippler is at rest with an empty wagon in its cage which has been unloaded during the previous cycle. A full wagon is now uncoupled from the train, with brakes released, and the charger is ready to push it to the tippler. The beetle is ready to engage either the front or rear wheels of the second wagon in the train, the leading wagon of which is still coupled to it with all wagons braked. Both thruster-operated stops on the approach section to the tippler are in the "up" position, when controls for beetle, charger and tippler are on "automatic." Under this arrangement the operator has only to initiate two actions, after having engaged the charger on the wagon wheel; the action of a push button lowers the first rail stop and a second button will start the charger on its forward run. There is a comprehensive arrangement of interlocks and limit switches controlling the action of tippler, beetle, charger and other equipment. The

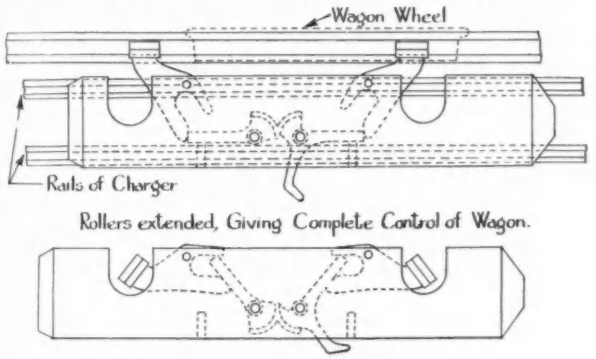

Wagon Wheel
Rails of Charger
Rollers extended, Giving Complete Control of Wagon.
Rollers retracted. Note Position of Quadrants.

Fig. 5. The charger head for pushing individual wagons to the tippler.

plant may be operated, if desired, on "semi-automatic" and "hand" control.

When a cycle begins, the full wagon passes over two thruster-operated stops, which rise automatically after passage of the wagon. The charger then pushes the wagon on to the table of the tippler, stops there and pauses for about two seconds, and then reverses, this action causing the arms to be automatically retracted into the position shown in the lower part of Fig. 4. The charger then proceeds backwards in order to be ready for the next loaded wagon. The loaded wagon in the tippler is now ready for discharging, and the tipping cycle is automatically started during return of the charger; as soon as the tippler has discharged the wagon, the charger is once again ready to bring forward the next wagon. This will push the empty wagon off the tippler for return under the action of gravity to the sidings, through the kick-back and spring-operated points. The next cycle is now ready to begin.

An arrangement of photo-electric cell relays on the outgoing track brings into operation an "empty-wagon-not-clear" red warning light on the operator's control panel. Until the wagon is well clear of the turn-out, further marshalling is interrupted. An interlock is also provided so that a wagon will not be tipped into the hopper if the latter is already full of coal. This interlock is actuated by a hinged plate set in the outer sloping side of the hopper and depressed by the weight of coal acting upon it. This causes a further red light to appear on the control panel, and until pressure on the plate has been released it will not be possible to operate the tippler.

The radial gantries and shipping booms are supported on towers which run on two four-wheeled bogies on which the shafts are fixed to the frame. The double-flanged wheels revolve in gun-metal bearing bushes fitted with thrust collars. Travel of the towers on their segmental tracks is controlled by limit switches set so that the traversing motor will automatically cut out when there is a gap of a few inches between the fixed buffer on the quay and the buffer on the bogie frame of the tower; in this position the towers can be anchored by substantial tie rods to hold them steady in a high wind. Since prevailing winds blow from the south west, the radial gantries are stowed at the eastern extremities of the racks.

The traversing gear for each shipping tower is operated by a slip-ring induction motor of totally enclosed design, developing 30 horse power at 725 r.p.m., driving a train of spur and bevel gearing through a worm and wormwheel reduction to give a final speed on the bevel wheel, engaging with the fixed rack, of about 2.34 r.p.m. There is a solenoid-operated brake between motor and worm-reduction gear, operated by direct current and exerting a pull of 66 lb. with a stroke of 2-in. A thruster brake is fitted to the shaft from the worm reduction driving the first pinion of the gear train; this exerts a thrust of 500 lb. with a stroke of 5-in., operating on alternating current Each shipping tower is able to move to a maximum distance of 55-ft. on each side of the centre line of the radial gantry.

There are two pairs of winches in the winch house behind the control room, one to provide telescopic movement of the shuttle and hinged boom, the other to give boom luffing movement between upper and lower limits. Each pair of winches is driven by an electric motor developing 30 horse power, operating through a 25 to 1 worm reduction gear, providing a speed on the winch drum of 5.94 r.p.m.

The shore end of each shipping gantry rests on a substantial pivot-bearing in the ground floor of the pivot house. In the upper floor of this building is the head of the inclined convevor which delivers coal from the hopper beneath the wagon tipplers to the radial jigger feeding the stream of coal to the bottom end of the shipping convevor. This radial jigger is suspended on vertical hangers from the roof truss, and is actuated by an electric motor of 10 horse power through an eccentric of the same type as that used in a steam locomotive. The radial supporting arms of the jigger are connected to a fixed pivot, and the connecting rod from the eccentric to the jigger is made of a special reconstituted wood, which has very high strength and resilience.

Power supply comes from the power station at the Tyne Commission Quay, about 700 yards from the coal shipping plant. A sub-station has been provided on the site to step down the incoming 5,750-volt circuit to 415 volts for power and 240 volts for lighting, all 50-cycle 3-phase alternating current. Direct current is required for many devices, such as contactor gear, operating coils, solenoid brakes, and protective equipment, so that rectifiers are provided where necessary for such energising circuits.

It is very important that there should be proper sequence of control on all belt feeders and belt motions throughout the plant, in order to avoid spillage of coal and possible disastrous jamming of the mechanism. This is ensured by means of an interlock sequence under the control of one man in the control cabin on each shipping tower. This operator is provided with a push-button control, to initiate the stopping sequence as well as the control for simultaneous shut-down in case of emergency. Each boom and tower motion has drum reversing controllers of cam type.

A clear view over the ship's hold is commanded by each control cabin, which is fitted with horizontally hinged windows, beneath which there are floodlights for night work. Inside the control cabin there are three controllers for the slewing, luffing and hoisting motions respectively. The operator is in telephonic communication with the railway wagon marshalling control station and a line is also provided to the mess room close to the tippler house.

Main contractors for this plant were Simon Handling Engineers, Ltd., with Strachan and Henshaw, Ltd. as main sub-contractors. All work was carried out to meet the requirements of the Tyne Improvement Commission, under the direction of their chief engineer, Mr. R. B. Porter, B.Sc. (Eng.), M.I.C.E. The installation is a great credit to all those who have been concerned in its design and construction.

Fork Lift Trucks in Docks

A Few Hints on Safe Operating

By D. N. RUSH

A short while ago, a survey of dock labour accidents in the Port of London disclosed that, whilst those in which cranes were involved were usually the most severe and those involving hand trucks were the most numerous, no accidents had been reported in connection with the use of fork lift trucks during the period covered by the report. It was, in fact, considered probable that the introduction of the fork lift truck had helped to reduce the overall accident rate by minimising the amount of man-handling.

The report went on to suggest that there was still much room for improvement in the safety of work in most docks occupations but hoped that the increase of mechanism—particularly in the use of fork lift trucks—would lead to further reductions in the accident rate.

Whilst it is gratifying to see that logical conclusions have been drawn regarding the contributions which fork lift trucks can make towards safer working conditions in the docks (quite apart from other considerations) fork lift truck operating is not, of course, without its own attendant hazards. In fact, much interest has been shown recently in the various factors relating to the safe use of fork lift trucks in industry generally, and the Industrial Truck Manufacturers Association has issued an excellent "Safety Code for Industrial Power Trucks" which deals with the somewhat complex subject in a comprehensive but concise manner.

It is felt, however, that the particular conditions in which these trucks have to work in dock areas calls for special considerations of the safety factors involved. In view of the increasing use of fork lift trucks in this sphere, therefore, it was thought that a review of such considerations in these columns would be welcome.

Cranes, for instance, which were previously mentioned as villians of the piece, are also a source of anxiety to the fork truck driver who should pay particular attention to their activities to ensure that he does not move under or into rapidly descending or falling load.

This would perhaps suggest that a fork truck driver should have eyes in the top of his head. Indeed, in view of the frequently congested conditions of docks operating areas, it would be more appropriate to suggest that he should have eyes all round his head for his routes must at times resemble an obstacle race! Lorries loading and unloading, porters dashing about with barrows, bollards, coiled rope and other difficult-to-see booby traps—these all combine to ensure that the fork truck driver who wishes to remain popular must remain **alert.** He must also make sure that his view ahead is not obstructed by his load. If he cannot see clearly forward, he should travel in reverse. He should at all times adopt a safe travelling speed to suit conditions and should thus avoid sudden turns and stops which might dislodge his load.

Then there is the most important question of travelling surface and, in this respect, the docks fork truck driver is generally less fortunate than his industrial counterpart for cobbles, railway lines, loose objects, wet, slippery and uneven surfaces are often commonplace hazards which he has to tackle. The safety rule here is very simple—slow down, load down—and what a lot of trouble this commonsense behaviour can avoid!

Railway tracks referred to above are in themselves a further complication for although they are generally sunk below the travelling surface they should always be approached slowly and, where possible, crossed diagonally. This serves as a reminder that railway wagons should never be towed by a fork lift truck. The traction power is often there, but the indirect pull is simply asking for trouble as a moment's reflection will clearly show.

Dock edges and quay sides are two further points which the truck operator should have constantly in mind. As one American firm remarked—sky hooks are not supplied as standard equipment with fork trucks!

Dock areas abound in ramps and inclines and these provide further snags for the unwary truck operator. When descending a ramp, the load should not be at the front of the truck and therefore the operator should drive downhill in reverse. When driving uphill the load must be in front of the driver with the truck driven in forward gear and the load raised and tilted backward sufficiently so that the front is clear of the ground. When the truck is at angles to the ramp, moreover, the load should not be elevated as this affects the centre of gravity.

Much work in the docks has to be carried out during the hours of darkness and it is essential that all areas in which fork trucks are operating should have adequate lighting, and this can apply equally to certain areas during the day. Badly lighted warehouses in the daytime, for instance, can be as dangerous as the dockside at night—particularly when high stacking is in progress.

Another point which the fork truck driver should watch is the security of his load. All loads should be safely bonded and should rest against the carriage frame; they should not be pushed or hit with the ends of the forks. Where palletised loads are concerned, therefore, the operator should make certain that his forks are making a clean entry between the decks of pallets.

Many old warehouses are still being used in the docks and, here, attention should be paid to the floor loadings. The majority of these buildings are not designed to cater for fork truck operation and although this method can save much room and time, even in old buildings, the question of floor loadings must be considered at all times. Furthermore, many buildings have rather low overhead clearances and provide restricted room for manœuvrability generally. In such cases, the fork truck driver should watch rear end swing and lift heights, and must be familiar with the capabilities and limitations of his truck.

In the docks it is often necessary to use bridge plates for fork truck operation between one floor and another. Where possible, bridge plates of an approved design only should be used as these generally have a specific application. Where bridge plates are improvised, these should be checked thoroughly for strength and security.

It is a good idea to ban the giving of lifts on fork lift trucks as they are not designed or intended to be used for this purpose, which leads happily to the advisability of appointing authorised drivers. These drivers should be trained operators who are fully responsible for the operating and safe running of their trucks. They should have sound training and have at least some of the necessary personal attributes including good vision, sound judgment, alertness, commonsense and so on. It has been found that the appointment of such authorised drivers leads them to take pride in their jobs and to maintain and drive their trucks with a very high degree of efficiency.

This leads to a final point concerning the safe use of fork lift trucks, and that is the important question of maintenance. The expression "A stitch in time...." never applied more forcibly than it does in this instance for, although most trucks today are built extremely solidly and will stand up to quite an amount of arduous work and rough usage, there nevertheless comes a time when the best of trucks, without maintenance, calls it a day—suddenly! One hour spent in routine maintenance may save a couple of days with the truck out of service: it may also save injuries to personnel. One way in which the driver can help to keep his truck in good working order is to report any running faults immediately to a responsible person.

The foregoing has been an attempt to amplify the general rules for safe conduct in respect of dock operating fork lift trucks. Some of the points enumerated might appear to overlap those applicable to industrial truck operating but this is, of course, inevitable, for all the rules for safe conduct can be summed up under the heading of "Common Sense." Fork trucks are here to help **reduce** accidents and these suggestions merely point the way in which this aim might be achieved. It is up to users at all levels to co-operate.

Taking the Salt out of Sea Water.

The Netherlands Institute for Applied Physics Research announced recently that its research efforts into the desalination of water by means of electrodialysis are to be taken up internationally on a much enlarged scale. Britain, Australia, South Africa, and probably also the United States, are reported to be participating in the international effort. France and a number of other countries are also reported to be interested.

Development of a Mud Clearing Vessel

Design Based on Operating Experience

By ROLT HAMMOND, A.C.G.I., A.M.I.C.E.

The author recently had the interesting experience of visiting Hay's Wharf, Ltd., who have developed a mud clearing equipment, incorporating a number of air-hydraulic jets arranged on a swivelling mounting, for which a British patent has been granted; other patents are pending.

For about the last ten years a converted barge, the *Jean*, has been used for mud clearance work in and around the berths and basins of the company. She also has acted as a prototype for the new mud clearing barge now being developed. The design and layout of this new vessel have been based on the practical experience of the *Jean*, which has also been engaged on several important works in addition to her routine operations.

She was employed for clearing mud from below the river pontoons of the Blackwall Police Station to ensure that all police launches would be afloat at all states of the tide. This work was first undertaken in 1948, but was not necessary again until 1951, ample proof of the efficiency and thoroughness with which the apparatus works. Mud and silt was also cleared from below the berth pontoons at the Charing Cross Pier of the Port of London Authority. At Greenwich Pier, work carried out for the London County Council involved clearance of mud from the area between the dolphins after removal of the pontoon between them. Another

Fig. 1.

important work for the P.L.A. was clearance of mud from the pumping basin at the entrance to West India Dock.

One of the most outstanding achievements was at the Surrey Commercial Dock where a dock gate which had been blown into the river by a bomb in the second world war was successfully recovered. Probings disclosed that the gate was covered by mud about 20-ft. deep, and attempts to remove this mud by dredging were fruitless, because the dredged hole at once filled up and no progress could be made.

With the swivelling jets of the *Jean*, however, a crater about 80-ft. in diameter and from 15 to 20-ft. deep was gouged out from the mud, which was carried in suspension by the current to a point well clear of the site. Divers then descended and were able to arrange lifting tackle so that the dock gate could be raised by the P.L.A. wreck lighter without undue difficulty. Fig. 1 shows the gate raised by the wreck lighter, and the foredeck of the *Jean*, with the hand-operated crane used for raising and lowering the swivelling jets, supplied with water through the four flexible hoses.

During the second world war the *Jean* was also successfully used for the somewwhat unusual task of removing a mass of congealed

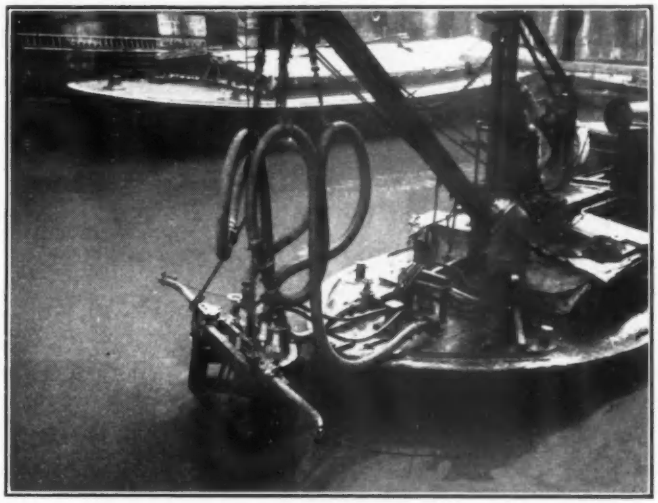


Fig. 2.

condensed milk from a berth. Experience again proved that this could not be have been done by any other method at reasonable cost.

The vessel can readily be applied to fire fighting or salvage duties and can also be used as a mobile floating compressor station for operating compressed air tools in places which may either be inconvenient or inaccessible by alternative means. Fig. 2 shows the *Jean* with the jet frame raised; the frame is suspended from the jib of the hand crane by chain tackle, and each hose is suspended from block and tackle purchases. The end of the arm on each side is attached to a wire rope which is led forward to winches so that the jets can be directed in any required direction.

The *Jean* is equipped with Ruston and Hornsby oil engines, giving a rated output of 120 horsepower, directly coupled to air compressors by Air Pumps, Ltd., through the medium of Anderton patent clutches. The centrifugal water pumps supplying high-pressure water to the jets are belt-driven from the engines. Operating experience has proved that the jets can be used for propelling the craft at a speed of about 4 knots, steering being effected by simply moving the swivelling mounting in the required direction by a rope led forward to a winch on each side of the vessel. Experience has also proved that all pressures and quantities are critical factors; and very detailed research has been undertaken in this respect.

An interesting problem was presented by the need for obtaining a permanent and accurate reading of water pressure in the jets and underwater piping system. This was solved in an ingenious yet simple manner. The face of each pressure gauge was smeared with grease and covered with a coating of graphite; the tip of the needle on the gauge was bent inwards and so scribed a clear mark on the blackened surface. A photograph then gave a permanent record of maximum water pressure at each point, thereby enabling adjustments to be made so that the most efficient operating condi-

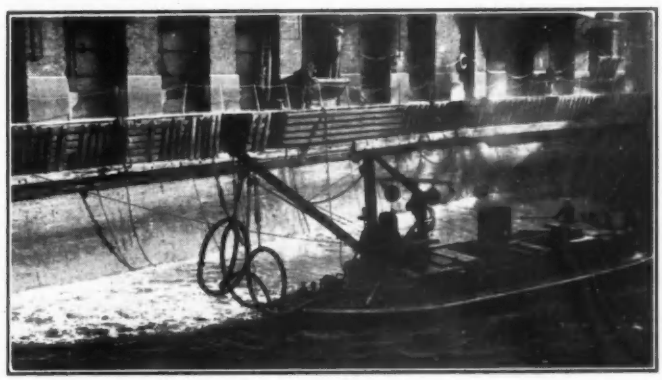


Fig. 3.

Development of a Mud Clearing Vessel—continued

tions could be determined. Fig. 3 shows the *Jean* clearing mud from Hay's Dock. This photograph depicts the escaping air from the air-hydraulic jets quite clearly.

A general view of the one-inch scale model of the new mud clearing vessel, exhibited at the recent Conversazione of the Institution of Civil Engineers, held in London, is shown in Fig. 4. The vessel is 63-ft. long, has a beam of 20-ft., and draws 3-ft. 9-in.; maximum working depth is 30-ft., and twin propellers are provided with twin rudders.

The air-hydraulic mud clearing nozzles, four in number, are mounted in a framework (clearly visible on the right of Fig. 4)

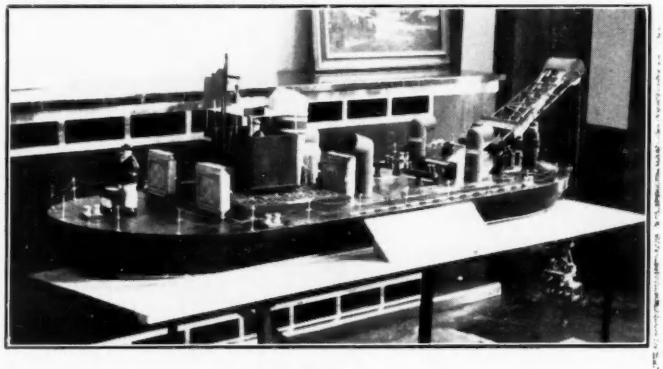


Fig. 4.

which is rotated by ropes led to a winch on each side of the vessel, through a system of sheaves so that the nozzles can be turned through a full circle at any depth. The nozzle assembly is suspended from a crane overhanging the bow, and the four armoured rubber water hoses and compressed air hoses are arranged side by side as a ribbon which can be stowed below the deck when the nozzle frame is raised.

A diagrammatic sketch (Fig. 5) shows the general arrangement of the machinery. The hoses (2) are mounted on carriers fixed between two standard industrial conveyor chains, which are driven by gearing from an independent power unit. The main engines (6) drive the water pumps (5) through belting, and also drive the twin propellers through reverse reduction gears and clutches.

The ribbon of hoses mounted on the twin conveyor chains is taken around sprocket (8), which is pulled horizontally along a rack

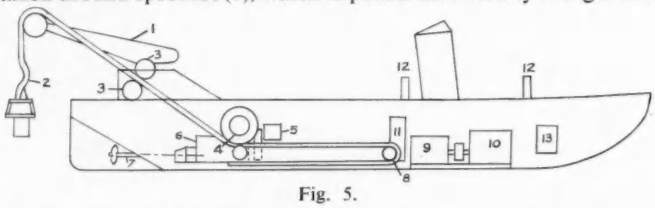


Fig. 5.

when the nozzle frame is raised by the crane, and in this manner the heavy armoured hoses are stowed in the hull of the vessel. The two engines (10) drive the air compressors (9) and compressed air is stored in the receivers (11). Engine water cooling is by motor car type radiators (12) with belt-driven fans, mounted on deck, providing a closed clean water circulating system. An auxiliary generating set (13), also driven by a diesel engine, is coupled to a general service pump and a starting air compressor.

The author is grateful to the proprietors of Hay's Wharf, Ltd., and particularly to Mr. H. Randal Steward, B.Sc., M.I.Mech.E., A.M.I.C.E., Chief Engineer of the Company, for the help which he and his staff have given in the preparation of this article.

Completion of Baudouin Sluice, Antwerp.

The last gate of the Baudouin Maritime Sluice, a description of which appeared in the December, 1954, issue of this Journal, has recently been placed in position and the entire construction work is almost completed. It is hoped to bring the sluice into operation on October 14 next. Together with the present Kruisschans Sluice, the new installation will help considerably to alleviate the pressure to Antwerp's dock navigation.

A New Type of Fender

The Floating Energy Absorbing Fender

The problem of providing for absorption of the energy, sometimes considerable, of a berthing ship, without damage to either ship or structure, has increasingly engaged the attention of harbour engineers in recent years. Many types of fenders have been evolved, which will absorb very large amounts of impact energy, but many of them are heavy and expensive to instal or repair. So far indeed all types of energy absorbing fenders have had to be supported somehow, either by the structure itself or upon a separate structure, thus, in some cases, greatly increasing the cost. Moreover many are only completely effective at one level of tide.

The Floating Energy Absorbing Fender, about to be described, is free to move with the water level, it places no vertical load on the structure, and the transverse force which has to be catered for is common to all fenders of whatever type considered.

This invention consists of a pontoon A (see drawing) floating in such a manner that the water line B-B is roughly a diagonal line across the transverse cross section. An arm C which is also part of the cross section projects upwards from the main pontoon and a pin D attached to the sides of the pontoon slides in a groove E which is part of the fixed structure of the dolphin, or wharf or jetty. When a ship strikes the arm C the part of the pontoon above water is forced to sink by rotating about the pin D, the energy absorbed being half the force required to sink the portion above water multiplied by the travel of the arm.

The resisting force is the weight of water displaced multiplied by the distance of the centre of gravity of the water displaced and divided by the distance of the point of application of the ship's blow, the distances all being taken with respect to the centre of pin D.

With a pontoon having the dimensions shown in A and in sea water

$$\text{the force per foot width of pontoon} = \frac{34.5 \times 3}{2} \times 64 \times \frac{23}{5.5} = 13850 \text{ lbs.}$$

If the travel is 1-ft.

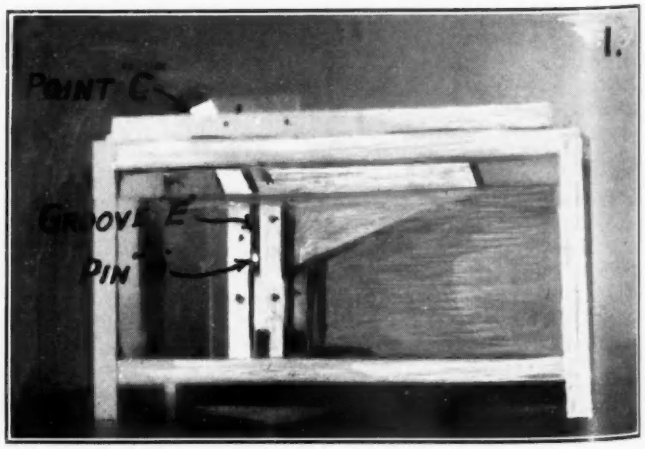
$$\text{Energy per foot width of pontoon} = 13850 \times \tfrac{1}{2} = 6925 \text{ lbs. feet.}$$

For a pontoon shown in the drawing about 21-ft. 1-in. wide the energy absorbing capacity would be

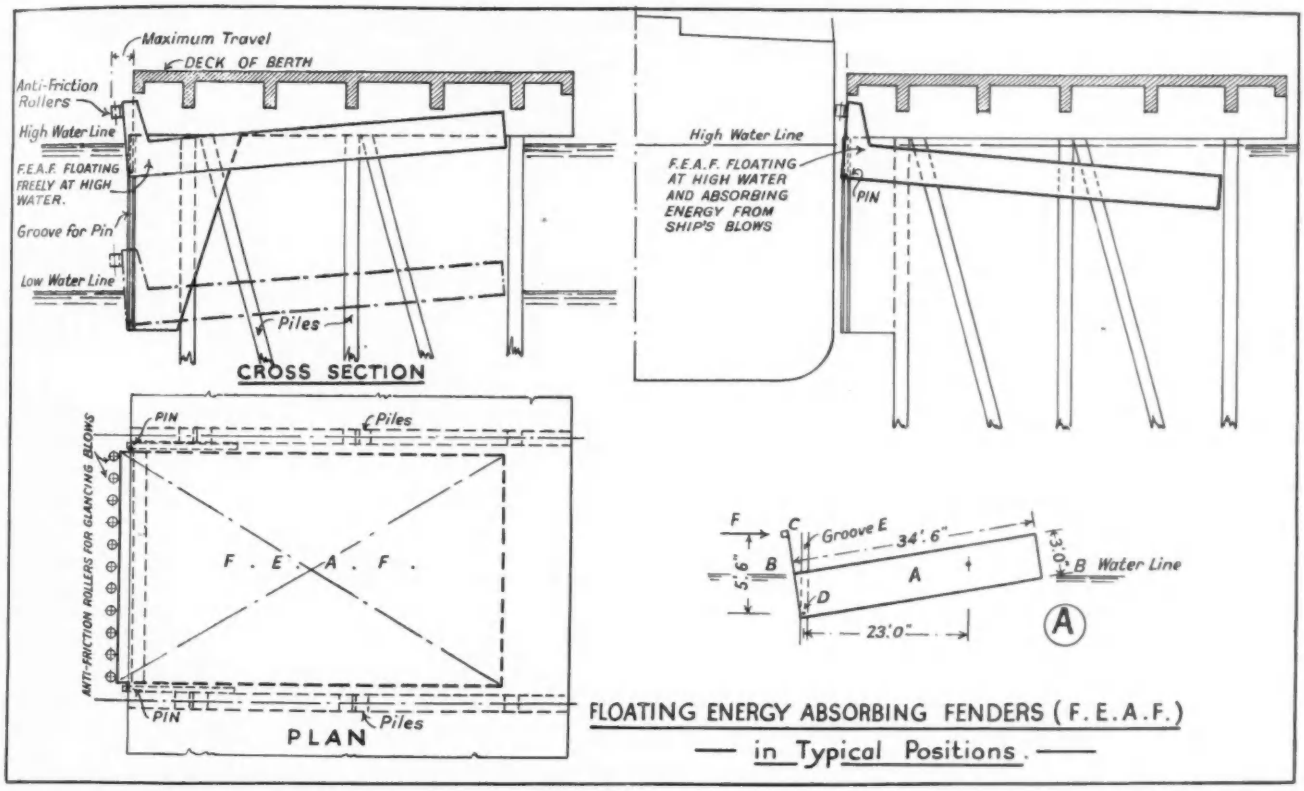
$$\frac{6925 \times 21}{2240} = 65 \text{ foot tons}$$

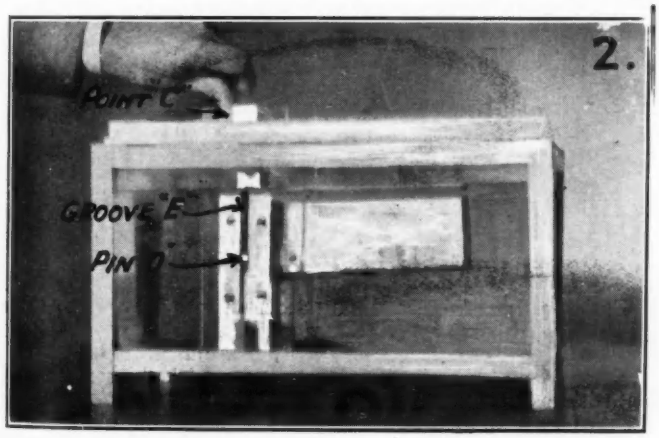
which is about the energy of a ship of 17,000 tons displacement when berthing with a velocity of half a foot per second.

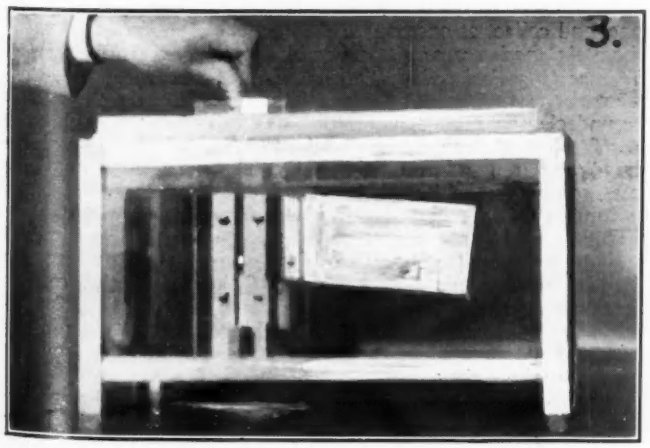
In photo 1 the sketch model is shown floating freely with the water line crossing diagonally from one corner to the other. Pin D, point C and groove E are arrowed.



New Type of Fender—continued







In photo 2 a force is shown being applied to point C and the pontoon is now fully immersed and the maximum force is being exerted.

In photo 3 the force has travelled further and depressed the pontoon further, the magnitude of the force is constant from positions shown in photo 2 to photo 3 and the energy absorption is now proportional to the travel instead of being proportional to half the travel as between photos 1 and 2.

In practice the pontoons will be made up of steel plates stiffened with angles and joists, and for a pontoon of the size shown in diagrammatic form it will take about 20 tons of steel.

The Floating Energy Absorbing Fender (F.E.A.F.) for dolphins, wharves and jetties is covered by Provisional Patent No. 31235/54.

Harbour Model Tests for Port Elizabeth

A recent issue of the South African Railway News states that a model of Port Elizabeth harbour has been built in Johannesburg to study the effects of proposed modifications and extensions on wave conditions in and around the harbour area. The area of the harbour, with quays, wharves and sea-walls, has been reproduced at one end of a tank measuring 30-ft. by 50-ft. and 27-in. high; all essential features of the harbour itself and the shoreline north of it for a distance of nearly two miles, as well as the sea bed extending about three miles into the ocean are represented to a horizontal scale of 1 in 400, and a vertical scale of 1 in 60. At the sea end an adjustable wave-generator can propagate waves of all sizes and periods towards the shore in the right direction.

Each proposed layout is tested at 104 different wave-periods covering all possible waves from short visible stormwaves to long groundswells. The waves are measured, at different positions in the harbour area, by means of pressure pick-ups from which the variations in water level are transmitted to styluses writing on smoked paper. The waves recorded are then analysed and comparisons made between different layouts. After completion of the tests on Port Elizabeth harbour similar tests will be made on models of the harbours of East London and Durban, and possibly Table Bay harbour. It is hoped to determine the effects in advance of any alterations to the different harbours.

H.M. Customs in British Ports

A Review of their Duties and Responsibilities

(Specially Contributed)

H.M. CUSTOMS AND EXCISE is one of the two main tax collecting Departments of the Government of the United Kingdom of Great Britain and Northern Ireland and collects indirect taxes on commodities. The Inland Revenue Department collects direct taxes on income from property, etc. Customs duties—" the Queen's dues according to custom from time immemorial " have been collected at ports from very early days and at the same time measures have been taken to prevent the evasion of dues by smuggling.

In addition to collecting Revenue, the Customs and Excise does much non-Revenue work for other Government Departments, in places where those Departments have not sufficient work to employ their own staff economically. For example, the Customs and Excise enforces prohibitions and restrictions for the Board of Trade on the import and export of certain goods; for the Ministry of Agriculture and Fisheries on plants and pests; and for the Home Office on arms, ammunition and drugs. Its local officials at seaports enrol and pay men for the Royal Naval Reserve on behalf of the Admiralty, and act as Receivers of Wreck for the Ministry of Transport and also as Registrars of British Ships. In addition the Customs and Excise Statistical Office compiles, from Customs declarations made by importers and exporters, the statistics of the Import and Export Trade which are published both monthly and annually.

The work of the Customs and Excise Department is carried out by three groups of officials:—

(a) Officers of Customs and Excise decide how much duty is due, and see that it is paid. They are not uniformed and are little known to the public. They control at the ports the landing and shipping of cargo legitimately imported and exported. They examine and take account of imported goods, and see that the proper duties are charged and paid on them.

(b) Preventive Officers of the Customs Waterguard Service are the uniformed officers well-known to the public. They prevent smuggling: that is, illegitimate movement of goods into or out of the country, thus ensuring that imports and exports move only through legitimate channels under the control of the Officers of Customs and Excise. For this purpose, they provide a network of revenue defence around the coast, and at docks, harbours and airports, and on the Land Frontier in Northern Ireland.

(c) Indoor and Clerical Officers are the officials behind the counter in Collectors' offices. They examine and pass merchants' declarations of goods to be imported or exported, receive the money for duties and purchase tax chargeable on imported and home-produced goods, and do every kind of clerical work.

H.M. Customs and Excise is managed by a Board of five Commissioners, appointed by the Queen under Letters Patent. At their head are a Chairman and a Deputy Chairman. For administration, the country is divided into 34 " Collections," each headed by a Collector, who is responsible to the Commissioners for the collection of all the Customs and Excise Revenue in his area, and for the control and management of all Customs and Excise business there. Most of these " Collections " have both Customs and Excise business. The Customs business is concentrated at the sea and air ports: Excise business is spread over the whole country, wherever excisable goods are made. All receipt of Revenue for each Collection is concentrated at the Collector's Office.

Imports and Exports are concentrated at the ports and airports, and on approved routes across the Irish Land Boundary. Attempts to import or export goods by other channels are illegal and the goods are contraband.

Customs Routine

To prevent surreptitious import and export, Preventive Officers of the Waterguard Service, and Coast Preventive Men, patrol near the coast day and night by motor-car, cycle and on foot. Around the coasts, Customs Revenue vessels patrol rivers, harbours, creeks and the sea approaches.

The first control of ships arriving is Quarantine—for health purposes. All ships must stop at the approved " Boarding Station " at the entrance to each port. The Preventive Officer on Boarding duties questions the captain and allows the ship to proceed if satisfied she has no disease infection on board. If he is not satisfied, the ship must await the Port Medical Officer.

As soon as the ship reaches her berth, or even before, Preventive Officers board her, take account of the unused dutiable stores on board and place a Customs seal on the store room containing them because they may be used duty free only while the ship is at sea. Only a Customs officer may break the seal while the ship remains in British waters.

[By courtesy of British Transport Commission

Customs Examination Hall, Ocean Terminal, Southampton.

Each member of the crew must declare to the Preventive Officer any dutiable goods in his possession. Duty is assessed and collected by the Preventive Officer at once on quantities too large to be allowed free of duty. Dutiable goods which the seaman does not wish to land may be put in the sealed store-room without payment of duty, and the owner may have them again only when the ship has sailed for foreign parts.

The Preventive Officers question passengers, examine their baggage, and collect at once any duty chargeable. *Limited quantities of certain goods are admitted free of duty by concession, provided they are fully declared.*

Preventive Officers " rummage " the ship—that is, they search for undeclared dutiable or prohibited goods, and any such goods they find are contraband, since all goods brought legitimately are already declared and duty-paid or secured. This rummaging gives great scope for the knowledge, experience and ingenuity of the Preventive Officer—in knowing where to search and what places are likely to contain contraband. Every ship has hundreds of likely hiding places, and no two ships—even sister ships—are quite alike in construction. The Preventive Officers do not make a big once-for-all search. They make make several visits at unforeseeable intervals, searching and re-searching different parts of the ship so that no member of the crew can know when they may return or where they will search next.

The Captain must deliver a Report of his ship and her voyage, cargo, etc., to the Collector of Customs (in practice to the Indoor

H.M. Customs in British Ports—continued

Waterguard Officers question a ship's crew about hidden contraband. (From the Central Office of Information film "A Thousand Million a Year.")

or Clerical Officer of the Report Branch) at the Custom House of the port. This Report is a most important document. It contains a complete list of all the consignments of cargo from each port of loading, details of all the ship's unused dutiable stores, and details (for Admiralty or Navigational warning purposes) of any wreck, derelict or iceberg encountered, or of any unusual event during the voyage. A copy of the Report is sent at once to the Officer of Customs and Excise at the docks, whose task is to control the landing of the cargo and take charge of it until released from Customs control.

Each importer of goods in the ship must "enter them at the Custom House" and declare their quantity and other details. Special forms for this purpose have been devised to simplify the work of the importer in declaring the details needed. When completed, he must present his "entry" at the Custom House, and, if the goods are for immediate home use, he must then pay any Customs duty chargeable. The Indoor and Clerical Officers examine these entries to see that they contain all the required details and comply with all the many laws and regulations affecting the import of goods, and these officers also receive the cash in payment of Customs duties. The original entry, when any duty immediately chargeable is paid, is accepted and signed by the Collector (in practice by the Indoor or Clerical Officer), and is then sent to the Docks for examination of the goods and their release if found correct. The Importer must present one, or in some cases more than one, duplicate copy of his entry. The duplicate of each entry is sent by the Indoor or Clerical Officers to the Customs and Excise Statistical Office where it is used to compile the overseas trade statistics, which could not be produced without this form-filling by importers.

Landing the Cargo

As soon as the ship is reported at the Custom House—or earlier for perishable goods, by special arrangements—landing of cargo may begin under the control of the Officer of Customs and Excise at the ship's side (usually called the Landing Officer). He must see that all goods landed remain in official custody at the ship's side until examined and released from Customs control. He knows from his copy of the ship's report what goods should be landed. He must secure specially any goods not reported in case their omission from the report was an attempt to evade duty payment. He must enquire closely about goods reported but apparently not landed to make sure they have not been surreptitiously landed and removed without his knowledge. This landing of cargo may take only a few hours for a small cross-Channel ship which sails daily, but it may last a week or more for a large liner. Whether the time is long or short, the Landing Officer needs constant vigilance.

The entries made by importers at the Custom House are sent to the Landing Officer at the docks for examination and release of the goods. All goods are liable to Customs examination, but all packages are not always required to be opened. The Landing Officer decides what packages must be examined, and the importer or his agent opens them in his presence. The officer examines the goods in the importer's or agent's presence to see whether they correspond in description, quantity, value and duty liability to those declared by the importer on his "entry." If correct, the officer releases the goods, and the importer or his agent may then re-pack them and remove them from the docks. If the "entry" declaration is materially incorrect, the officer must detain the goods until the "entry" is corrected and any additional duty chargeable is paid. If any unentered goods are concealed in the packages with intent to evade duty payment, the concealed goods, the goods packed with them, and the container, are all liable to forfeiture; and if the importer has knowingly misdeclared them, he is liable to prosecution.

Customs Officers do not open, unpack or re-pack the goods they examine. By law, and in fact, that is done by the importer himself, or more usually, by an agent employed by him. Examination of goods is expert work requiring constant vigilance, alert intelligence, and wide knowledge of the appearance and nature of goods of all kinds. Much of its also needs great skill and experience in measuring and calculating techniques; for example, in computing the gallonage of casks after gauging them with measuring rods which show their dimensions in fractions of an inch. Large differences of duty charge often depend on very small differences of measurement. The Officers of Customs and Excise are specially trained for these jobs, but skill, knowledge and experience are their most valuable qualifications.

Exports

During landing of the cargo, the Preventive Officers continue their rummage of all parts of the ship including the cargo holds as they become clear of cargo. When all the cargo has been landed, the Preventive Officers make a further rummage, particularly of cargo holds, and give the captain a certificate of "Clearance Inwards." The captain takes this certificate to the Clerical Officers at the Custom House when he goes to arrange his next voyage. There, if the next voyage is to be foreign, he "enters" his ship "outwards," and the Clerical Officers record that the ship has been "Cleared Inwards" and is "loading."

Exporters will now already have begun to appear before the Clerical Officers at the Custom House to declare their goods for export. Various forms are used according to circumstances. As a rule, though not always, a duplicate of each declaration is re-

A Rummage Crew of Waterguard Officers search a ship for hidden contraband. (From the Central Office of Information film "A Thousand Million a Year.")

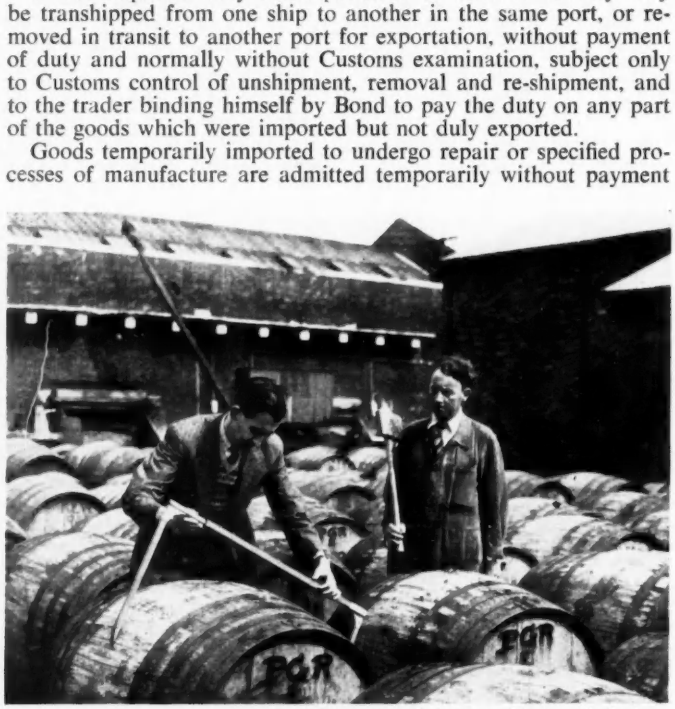
H.M. Customs in British Ports—continued

quired (as with import " entries "), so that the Customs and Excise Statistical Office can promptly prepare its export trade statistics. The Clerical Officers at the Custom House examine these exporters' declarations and see that all necessary details are given, and that export licences accompany them if required. If satisfied they pass and sign the declarations, which are then sent to the docks if the goods or the transaction is of a kind requiring Customs control at the ship's side.

There are no Customs Export duties, but export control is necessary for a variety of purposes. Export is prohibited of some goods such as arms, ammunition, war material and scarce goods needed at home; their export must be prevented. Some duty-paid goods are eligible for refund of duty if they are exported. Others, though dutiable if for home use, may be exported duty-free under bond. Customs control of these exports ensures that they are duly exported, and not re-landed.

Goods imported only for exportation to another country may be transhipped from one ship to another in the same port, or removed in transit to another port for exportation, without payment of duty and normally without Customs examination, subject only to Customs control of unshipment, removal and re-shipment, and to the trader binding himself by Bond to pay the duty on any part of the goods which were imported but not duly exported.

Goods temporarily imported to undergo repair or specified processes of manufacture are admitted temporarily without payment



[By courtesy of the Port of London Authority

An Officer of H.M. Customs gauging casks of rum.

of duty provided the merchant either deposits the duty pending the re-exportation of the goods, or binds himself by bond to pay duty on any part of the goods not eventually re-exported. Goods temporarily exported under Customs supervision for process or repair abroad may be re-imported on payment of duty on the added value due to the process abroad. Touring motor vehicles, theatrical scenery and costumes, and commercial travellers' samples can move into and out of the country without payment of duty under smooth-working Customs facilities designed only to ensure their due re-exportation.

The Officer of Customs and Excise in charge of loading at the ship's side (usually called the Export Officer), sees that no prohibited goods are shipped as cargo. He examines dutiable bonded goods and drawback goods to see that all those entered for export are brought to the ship's side, and after examination, that they are all duly shipped and not re-landed. Huge sums in duty or drawback may be lost to the Revenue if such goods entered for export are not, in fact, exported. The Export Officer controlling an export ship therefore needs constant vigilance, like his colleague on the import ship.

Dutiable goods for use as stores on board the ship during her coming voyage are brought to the ship's side, and the Preventive Officers place them in the sealed storeroom so that they cannot be used until the ship leaves British waters. The Preventive Officers also continue their rummage for smuggled or prohibited goods, and see that persons who visit or leave the ship do not surreptitiously take prohibited goods on board or bring smuggled goods ashore.

When all, or nearly all, the export cargo is loaded, the captain goes to the Custom House and requests " Clearance Outwards " of his ship. The Clerical Officers, when satisfied that all requirements of law and regulations have been fulfilled, issue a " Clearance Outwards " permitting the ship to sail. The ship may then sail. The captain (or, more usually, his Shipping Company), within six days, must deliver to the Collector an " Outward Manifest " containing a list of his export cargo, and the Exporter must deliver " Specifications " of goods shipped of kinds not subject to special Customs control. The Clerical Officers send these to the Customs and Excise Statistical Office where the export trade statistics are compiled from them.

When certain kinds of goods are exported, the duty paid on some kinds of dutiable ingredients used in their manufacture can be refunded as " Drawback." Examples are tobacco used in making cigarettes for export, sugar and chocolate used in making confectionery for export, and linseed oil used in making paint for export. The tobacco drawback is particularly valuable to manufacturers.

As soon as drawback goods are shipped, the Export Officer at the ship's side certifies them " Shipped " on the Shipping Bills relating to them. He then sends the bills to the Custom House where the Clerical Officers use them in payment of drawbacks to the exporters concerned.

Bonded Warehouses

Bonded Warehouses are secure storage places approved by the Customs and Excise for the deposit of goods on which duty has not been paid. They enable the owners of dutiable goods to postpone payment of duty until they want their goods for use. Most goods liable to Customs or Excise duty can be deposited in them. Duty is charged on delivery from the warehouse for home use, but is not charged if the goods are exported.

The 2,000 Bonded Warehouses in the United Kingdom are an immense convenience to traders. The stocks of dutiable goods in them are very large; more than £3,000,000,000 would be needed to pay the duty chargeable on them.

Bonded Warehouses are not owned by the Crown or by the Customs and Excise, but belong to private owners, Warehousing Companies or Dock or Harbour Authorities. The owner binds himself by Bond (hence the name), to pay the duty chargeable on any goods lost, abstracted or removed from the warehouse without Customs and Excise consent. When a Bonded Warehouse is not open for business it is normally secured by two locks—a Customs and Excise lock, and a Warehousekeeper's lock—so that neither Officer or Warehousekeeper can enter unless both are present.

The Officer of Customs and Excise in charge of the Revenue interest at the warehouse (usually called the Warehouse Officer), takes account of goods which arrive for storage, and carefully identifies them from the details sent to him by his colleagues at the place whence the goods were removed. He sees that they are intact and he records his account of them in his Warehouse Register.

Many different kinds of operation are allowed on the goods in warehouse, under the control of the Warehouse Officer, to prepare them for marketing or sale—such as re-packing or dividing packages, or blending and bottling of wines or spirits, etc., but manufacturing operations are in general not allowed because bonded warehouses are not intended to have the character of factories.

No duty is charged on legitimate natural losses during storage, nor on legitimate losses in operation, nor on goods lost or destroyed by unavoidable accident in warehouse. The Warehouse Officer investigates such losses, and sees that only legitimate losses are allowed free of duty.

Warehoused goods may be exported under bond without charge of duty. The Warehouse Officer examines such goods before delivery, and later sees that proof of their exportation is received from his colleague at the export ship's side. Duty may be charged on any goods not actually exported.

When warehoused goods are wanted for home use, their owner

H.M. Customs in British Ports—continued

prepares a form called a "Home Use Warrant" giving full details of the goods, and presents it, with the duty chargeable, to the Clerical Officers at the Collector's Office. These officers take the money and sign the warrant in the name of the Collector. The owner presents this signed warrant to the Warehouse Officer as proof of duty payment, and the Officer if satisfied the correct duty has been paid, releases the goods from warehouse.

The Warehouse Officer keeps a Warehouse Register containing a complete account of each consignment, and a Warehouse Ledger showing the totals of each consignment received or delivered. These two books together enable him at any moment to know both the details and the totals of goods of each consignment and of each description which are still in warehouse. The totals of warehouse stocks are published monthly, and are of great value to traders in judging probable market movements.

Throughout these operations the dock and wharf Customs Officers work closely with the warehousekeeper's or quay superintendent's staff including the ledger staff, and with the dock or harbour authority's own police force.

Smuggling and Contraband

Smuggling and other evasion of Customs and Excise duties are an ever-present danger. Customs and Excise Officers have power to seize smuggled goods and to prosecute the offenders. 24,167 consignments of smuggled goods were seized last year, including 18,998 lb. of tobacco and 437 gallons of spirits. 2,426 persons were convicted by the Courts for Customs and Excise offences last year—1,662 of them for smuggling. 39 persons were sentenced to imprisonment without the option of a fine. The number of seizures and convictions is much larger than in pre-war days, partly due no doubt to higher duties which increase the incentive to smuggle; but also due to the growth of organised smuggling on a commercial scale. The Customs and Excise has an Investigation Branch whose officials are expert in detecting Customs and Excise offences and in bringing the offenders to justice.

Smuggled goods seized by the Customs, and dutiable or restricted goods detained pending payment of duty or production of licence, are sent to the Queen's Warehouse at each port. Smuggled goods are sold for the benefit of the Revenue through ordinary trade channels, but dangerous or noxious articles, or articles whose importation is prohibited for other reasons—and which obviously cannot be sold—are destroyed or otherwise disposed of by the Customs.

Before concluding this review of H.M. Customs work in British ports reference should be made to Protective Duties which are additional to the normal Customs dues.

The chief protective duty of Customs is the General Tariff duty of 10 per cent. by value, with higher rates for some articles, imposed for the protection of the home manufacturer and producer, on many imported goods from foreign, but not from Commonwealth, countries.

Ottawa Duties for the protection of Commonwealth countries, are charged on certain goods (mostly foodstuffs), imported from foreign countries, but not on such goods from Commonwealth countries.

Key Industry Duties, for the protection of the home manufacturer, are charged on imported fine chemicals and precision instruments from foreign, but not from Commonwealth, countries.

Beef and Veal Duty for the protection of the home farmer, is charged on foreign, but not on Commonwealth, beef and veal.

Imperial Preference. Goods from Commonwealth countries are either completely exempted from Customs duties, or are charged at lower rates (with a very few exceptions, e.g. oil, petrol, matches, etc., and goods liable to Purchase Tax from Commonwealth countries are charged at the same rates as those from foreign countries).

Carriage of Bulk Grain by Tankers

Baltic Conference Comments on Conversion Costs

The Monthly Circular of the Baltic and International Maritime Conference for August last, contains a memorandum on the carriage of grain in bulk by tankers. While pointing out that the costs of fitting out most tankers to carry grain will be high, the memorandum suggests that over the last four months altogether 15 fixtures may have been made, and that there are grain charterers still interested in taking tankers.

The memorandum recalls that a few months ago reports were circulated of several tank vessels having been fixed to carry grain in bulk from North America to the Continent. At the same time it was intimated that other owners of tank vessels had displayed an interest in similar business.

"Behind this development lies the fact that rates of freight in tanker markets have been low for long periods, whereas grain cargoes have been offered at fairly attractive rates. Thus it becomes a matter for calculation whether it pays to incur the expense of converting a tanker into a grain carrier.

"The total expenses will vary from vessel to vessel and according to the place where the conversion is carried out. In most cases the total expenses will be heavy and presumably it will be found that it will not be a paying proposition to incur the expense unless the vessel can be fixed to carry out consecutive voyages with grain in bulk at attractive rates of freight between ports where the grain can be loaded automatically and discharged by modern grain elevators or pneumatic suction elevators."

The Conference suggest that some of the points to be taken into consideration are these:—

(a) What are the requirements according to safety regulations, Board of Underwriters, shippers or other parties—(1) As to shifting boards, etc.; (2) As to cleaning of the tanker and deodorisation?

(b) What are the expenses of complying with such requirements?

(c) What are the costs of loading and discharging of grain in bulk carried in tank vessels—will the same rates apply as for dry cargo vessels?

(d) What daily loading quantity and daily discharging quantity are the charterers prepared to guarantee?

(e) At many ports there are no facilities to discharge grain in bulk: it may be necessary in such ports to resort to the usual procedure for dry cargo vessels and arrange for the discharge by tubs or in bags filled in the holds and removed by means of ship's winches or shore cranes. The only solution may then be to fit out the tank vessels with one or more suction pumps or conveyors.—What would this cost?

(f) What can be done to ensure that loading time begins to count immediately a vessel arrives at the loading port and prevent delays pending inspection or approval of the tanks?

(g) There is also the important question of any responsibility in case of cargo taking on an odour and whether the charterers or shippers are prepared to give an undertaking exonerating the vessel in this regard.

Recommendations by American Cargo Inspectors.

The Conference approached the National Cargo Bureau, Inc., New York, in order to find out whether the issue by the Bureau or by any other society of a certificate of inspection or approval of a tanker fitted to carry grain in bulk would exonerate an owner if the cargo on discharge were damaged or affected by gas or odour. The Cargo Bureau stated they were not in a position to give an answer, but enclosed a bulletin which they had issued for the information of their surveyors pending the issue of recommendations or instructions. The bulletin, which was issued in December last, contains the following:—

"We have received a number of inquiries from various ports on the question of preparing tank vessels for the purpose of carrying bulk grain. The owners and operators of these vessels are most anxious to secure information so that they will be in a position to negotiate charters and enter their vessels in the grain trade.

"Because this is a new experience in the carriage of grain in peace time and the only similar experience was carried out in

Carriage of Bulk Grain by Tankers—continued

World War II in ore carriers and some tank vessels from Canadian ports, we feel it is necessary to furnish you with such information as we have up to date. It may be noted that the experience during the war period was reported to be a successful one.

" Inasmuch as these vessels are sub-divided (except in the dry cargo compartments) into 20 or 30 tanks there is no shifting problem involved and these sub-divisions are the equivalent of and in fact exceed the minimum requirements for stowage and transportation of grain in bulk on board vessels as required by the United States Coast Guard Regulations.

" In an effort to attain uniformity, we submit the following:—

1. The No. 1 dry cargo hold and decks, if used for grain, shall be fitted with shifting boards and feeder as provided for in the Grain Regulations for any dry cargo vessel.

2. The tanks or compartments which have been used for liquid cargoes must be thoroughly cleaned and all traces of previous cargoes and odours removed so that there is no possibility of the grain becoming contaminated. In this connection, all pipe lines to cargo compartments shall be thoroughly cleaned or blown out. All pipe lines, except suction lines, to be blanked off in the pump-room or engine-room.

3. It is necessary for the bilge suction in each tank to be boxed in the lumber fitted over the top of the two longitudinal frames adjacent to each bilge suction and boarded up with 3-inch lumber, suitably covered with burlap. This will prevent the entrance of grain into the suction and at the same time permit the drainage of water into this well. The construction of this box or enclosure may be difficult to accomplish with certain types of tank vessels; nevertheless, the Surveyor shall see that the suctions are properly protected and boxed to accomplish the purpose outlined above.

4. Tank vessels as a rule are not equipped with sounding pipes so that soundings can be made to the bottom of the tank. The operator should be advised that suitable means should be provided so that these compartments may be sounded. This can be accomplished by extending a pipe from the ullage hole to the bottom of the compartment or in any other suitable manner.

5. There are a number of tank vessels usually of the single-deck type where the main cargo tanks are vertical cylinder tanks approximately 50-ft. in diameter extending from the bottom of the vessel to the main deck. Some of these cylindrical tanks are only partly sub-divided by a centre-line bulkhead in which case it will be necessary to erect shifting boards 8-ft. or one-third downward from the deckhead as required by Bulk Grain Regulations."

Fitting Out and Tank Cleaning Costs.

On the question of fitting-out costs, the Conference memorandum states: " The costs of fitting out tank vessels and cleaning the tanks to make it possible for them to carry grain may vary considerably from case to case, but for most vessels they will be high. According to one report, for a T2 type of tanker the total cost in a United States port would be between $15,000 and $20,000. In addition, if the cargo of grain in bulk had to be discharged in a port where there is no pneumatic grain elevator, the tanker would have to be equipped with several suction pumps which, it has been stated, may cost between $30,000 and $40,000 each.

Conference members in New York, on being consulted about these costs, replied on July 11 last, as follows:—

. . . So far consecutive contracts have been restricted to sucker discharge ports such as Antwerp or Rotterdam. The type of equipment usually suggested is a conveyor belt system requiring two portable conveyors, one for discharging cargo from the tanks and one to discharge over the rail. Such conveyors cost about $9,500 each. Some owners are thinking of such equipment only, while others consider combining two such conveyors with a pneumatic pump for removing the grain from the wings and other places which may be inaccessible to the conveyor belts. One local owner has received an estimate of $20,000 for such a pump.

The cost of loading such vessels has varied considerably and is much more than the cost of loading a standard dry-cargo type of vessel. A Liberty-type tanker has paid as much as $0.65 per ton to load in a United States Gulf port while a 15,000-tonner paid about $0.45. This compares with the usual dry cargo stevedore cost of $0.25 to $0.28 per ton.

Regarding the cost of cleaning a tanker for the carriage of grain, a local owner has advised us that he received a firm bid of $17,000 to clean a T2-type vessel at Baltimore, to meet the Board of Underwriters and classification requirements. This vessel has been running in the crude oil trade for several years. However, at other ports such a vessel might have to pay between $20,000 and $25,000.

Size of Vessel Preferred.

The Conference produce no definite figures of the number of tankers which have been fixed for grain cargoes this year, but suggest that over the last four months some fifteen fixtures may have been made.

In conclusion, the memorandum states: " There are grain charterers still interested in taking tankers. The size they prefer is about 10-13,000 tons d.w. Offers of tankers of 18-22,000 tons have been declined, these vessels apparently being considered too big. Of late the rates of freight for oil cargoes have risen and for that reason there is obviously less interest on the part of owners to accept grain for their tankers. The age of a tanker may also have a bearing on the matter; should it prove difficult to employ an old tank vessel profitably as an oil carrier, she may possibly still be useful as a grain carrier."

Obituary

Mr. Eustace W. Porter, M.B.E., M.I.C.E.

We regret to announce the death on August 4 last of Mr. Eustace W. Porter, M.B.E., M.I.C.E., of Drumfield, Inverness.

Born in Finchley, London, in 1872, Mr. Porter was indentured under the locomotive superintendent of the North London Railway for five years, and during the same period studied at the City and Guilds Technical College and the University College for Civil and Mechanical Engineering. He was next articled to the late Mr. Edmund Olander, bridge engineer, Great Western Railway, and two years later was appointed to the staff of the Chief Engineer of the G.W.R. In 1897 he became Assistant Engineer to Messrs. W. Duff Bruce and J. Angus, Consulting Engineers to the Assam-Bengal Railway and Calcutta Docks, and in 1899 was appointed to the head office staff of the Director of Works, Admiralty, being later appointed to an executive position in Devonport dockyard. In 1907 he became Personal Assistant Engineer to F. E. Wentworth Shields, M.I.C.E., Chief Engineer of Southampton Docks, and worked on the construction of the 16-acre Ocean Dock.

In 1912 Mr. Porter was appointed Resident Engineer and Manager of the Caledonian Canal at Inverness, which position he held until his retirement in 1937. The first major reconstruction of the canal since it was built a century before was carried out under his supervision in 1920-21. The work included the renewal in improved form of the lock gates, entrance jetties, lighthouses, etc., as well as the complete reconstruction of employees' homes. Before his retirement he was able to complete the reconstruction of many of the swing bridges across the canal, to meet the needs of the vastly increased road traffic.

Mr. Porter was a Member of the Institution of Civil Engineers and of the Institution of Mechanical Engineers, as well as a Member of Council of the Institution of Junior Engineers. He was awarded the M.B.E. on his retirement in 1937.

Radar Installation at Rotterdam.

It has lately been announced that the installation of a large radar system covering Rotterdam and the New Waterway is progressing favourably and is expected to be completed by the beginning of next year. It is claimed that when in operation, the station will be the most important civil radar installation in the world, maintaining continuous contact with vessels from three miles offshore until they berth in port. There will be seven radar posts functioning along the coast, all of which will be in direct communication with the command post at Rotterdam, and the pilots will be able to maintain contact with Rotterdam by means of portable radio sets.

Port Health Authorities

Excerpts from Anuual Reports of the Ports of Manchester and the Humber

The annual reports of the Port Health Authorities of Manchester and the Humber Ports (Hull and Goole) have recently been issued. In the former, attention is drawn to the problem of combating excessive smoke from the smaller vessels using the Manchester Ship Canal. The latter report deals with the procedure adopted for the inspection and rat proofing of ships.

The Port of Manchester

There was an appreciable increase in the volume of shipping using the Manchester Ship Canal. The number of ships entering during the year was 4,749 aggregating 7,323,840 tons, of which 2,056 ships of 5,662,981 tons were from foreign ports, and 2,693 of 1,660,859 tons were coastwise.

Vessels inspected were as follow:—

	1954	1953
Ships entering the port	4,749	4,555
Number inspected	2,051	2,046
Percentage inspected	43.18	44.91
Number reported defective	642	793
Number on which defects remedied	432	457

In the course of the report it is stated that during the year complaints were received regarding the emission of black smoke from the smaller vessels plying along the canal. Observations taken on vessels revealed that black smoke was frequently made for up to half-an-hour, and periods of 10—15 minutes were common. On one occasion visibility at a lock was reduced to 10 yards by the pall of smoke from a vessel locking in. Trails of smoke extending for half-a-mile were seen.

Coal-Burning Tests.

From observations taken it was doubtful if the methods of stoking or the type of fuel in use were the most suitable. Two trips, lasting about three hours each, were made on similar coal-burning cargo vessels of about 500 gross tons to inspect the boiler-room practice. On one of these vessels pitching only took place every half-hour, and on one occasion an hour elapsed between firing. A deficiency of secondary air was noted and the fuel was not that usually burnt by shipping for steam-raising purposes. Some black smoke was observed after pitching, and the opening of the fire doors to admit secondary air was stated to cause cracking of tubes, with resultant danger.

The crew of the other vessel seemed intent on preventing smoke, and with more frequent smaller pitches this was effected. During the three hours that the observations were being made, the fireman had only one break of 25 minutes. Most of the time he was engaged in heavy manual labour in extreme heat, and continuance for the 24 to 26 hours' duration of the voyage would be impossible.

Warning notices were placed aboard several craft. Occasional heavy smoke was seen from larger vessels, but this was generally due to a temporary lapse in boiler-room efficiency, and was remedied when attention was drawn to the matter, or when defective equipment was repaired.

On the question of smoke abatement, the report states that special attention was given to this problem during the year, and offending vessels were visited whenever possible. Vessels lying alongside were easily dealt with and in the majority of cases verbal notices and warning was sufficient to obtain abatement. Personnel of foreign-going ships were generally quick to appreciate the position and co-operated to the best of their resources.

The most difficult aspect to control concerned traffic under way along the canal, the chief offenders being coasters, tugs, sand hoppers and canal boats of old construction and using coal for fuel. Reported offences in canal sections bordered by residential districts were mainly due to this type of craft. In serious cases owners were communicated with and their co-operation requested. "To fully appreciate the difficulty in controlling this problem one must bear in mind the length of the canal, together with the large amount of daily commerce. The immediate solution appears to be publicity and propaganda backed by the full and willing co-operation of owners, masters and crews."

New Oil Dock.

Shortly after the opening of the new oil dock at Eastham it became evident owing to the close proximity of the adjacent village that careful watch would have to be kept on tankers berthed in the dock. In April, the position was headlined by the Press, when three tankers simultaneously emitted excessive smoke which was blown by a fresh easterly wind towards and over the nearby residential district. Prompt action was taken, but complaints were received from both official and private sources.

Since that incident the following procedure has been adopted. All tankers arriving at the oil dock are boarded by a police officer of the Manchester Ship Canal Company, who hands the master a printed "smoke" notice (supplied by that Authority) drawing attention to the necessity of keeping smoke emission down to a minimum as laid down under the Public Health Act, 1936.

During their stay, tankers are kept under observation by the police in the course of their ordinary duties and representations are made if contravention occurs. This system has worked smoothly, and since its advent the position has improved to an encouraging level. It is also invaluable because it ensures supervision over the considerable periods when health inspectors are not present to act.

The Ports of Hull and Goole

The annual report for 1954 of the Port Health Authority states that during the year 10,785 vessels entered the ports of Hull and Goole with a total net tonnage of 7,775,593 as against 11,549 vessels with a total net tonnage of 8,109,052 in 1953. In the year under review 396 ships were boarded on arrival by the Medical Officers of the Authority; this shows a decrease of 92 when compared with 1953.

The Port Health Inspectors visited 6,237 vessels, on 537 of which sanitary defects were discovered; 162 of these were rectified. In 1953 the figures were respectively 6,534, 626 and 193.

During the year 20,948 passengers, Alien and British, entered or departed from the ports, as against 20,038 for 1953. British passengers outward increased by 628. Five cases of malaria were landed from vessels during the year and two cases were reported to have been disposed of prior to arrival. These figures the report states, indicate the continued favourable trend as regards the incidence of malaria on vessels from the West Coast of Africa.

Inspection and Rat Proofing of Ships.

Dealing with measures against rats in ships, the report states that the Authority's Inspectors and/or Rodent Searchers inspect all ships from foreign ports for exidence of rat infestation, special attention being directed to those coming from Infected Areas. In 1954 the latter numbered 431. Where evidence of recent infestation is found traps are laid to confirm the findings. Traps were set on 152 ships and 217 rats were caught. In all 430 rats were killed in ships from foreign ports and 421 in warehouses on the dock estate. A proportion of all rats trapped and all found dead, including those destroyed by the rat catchers employed by the British Transport Commission, are submitted to the director of the Public Health Laboratory Service for bacteriological examination.

The application and incorporation of rat-proofing principles in the construction of new ships continues. Where, during the course of inspection, the officers of the Authority discover unprotected rat harbourages, masters, owners or agents are requested to undertake remedial measures. During the year four vessels were treated with "1080" for destruction of rats and deratting certificates were issued on the completion of each treatment. The result in each case was considered to be fairly satisfactory but the report notes, until some form of check is devised to assess whether or not complete elimination of the rat population has been achieved by the use of this rodentcide, opinions as to its merits must be reserved. The Authority's experience so far indicates that where heavy infestation exists and "1080" is used, a second treatment might be of value. If this method were adopted for a limited period, a check could be made as to the real value of this poison. On the other hand, where the infestation is only slight, it would appear that a single treatment would suffice.

British Inland Waterways and the Trent Navigation

An Evaluation of Present Conditions and of the Possibilities of Future Developments

(By our own Correspondent)

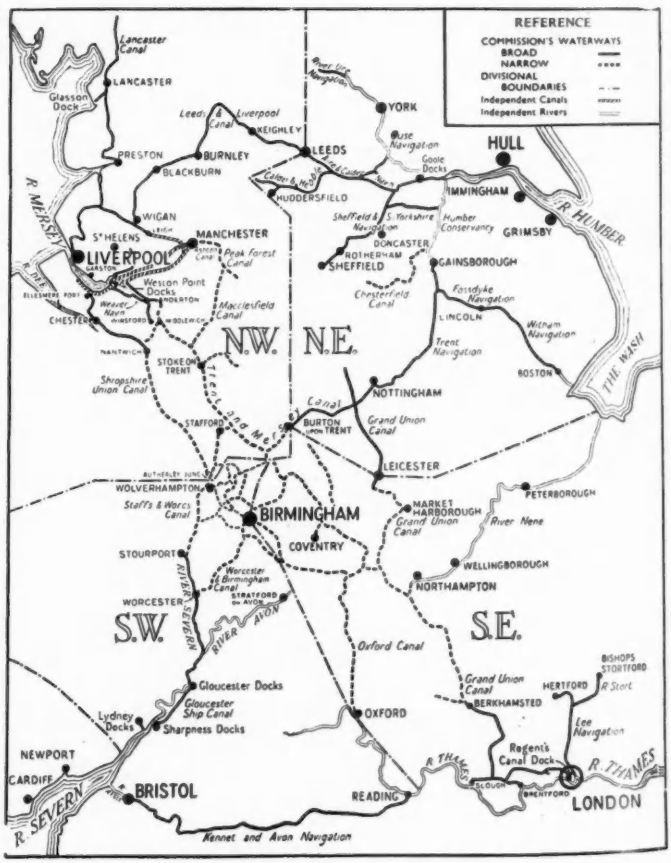
IN the study of the potential for traffic on any particular navigable river or canal route in Great Britain, it has been found that the answers to the following questions will throw light on the situation and often establish whether on balance there are reasonable commercial prospects. The questions of primary importance are :

1. Does the route connect with an important port area?
2. Will the route accommodate craft of such size and design that they can act as motorised or dumb lighters in the port area?
3. Does the route lead to an industrial area or areas, to which there is a substantial flow of import traffic, or are there corresponding prospects for export traffic?
4. Will the waterway accommodate (or can it be made to accommodate) boats or trains of boats of economic size, and permit reasonable speeds, allowing for delays at locks? This really poses the question whether carrying costs compare competitively with road and rail.
5. Are there prospects of approximately equal traffic in either direction?
6. Is the maintenance of the navigation to the standard dictated by question 4 likely to be especially costly, for any particular reason? That is to say, if it is a river navigation, are there likely to be abnormally heavy costs and obligations in maintaining weirs, in flood prevention and in continuous dredging? Alternatively, if it is primarily a canal navigation, are there heavy expenses in obtaining water supply to summit levels, in maintaining numerous locks or lifts, and in connection with tunnels, aqueducts and embankments?
7. Is the route liable to serious stoppages at certain seasons?

If the answers to these test questions are generally favourable, there are reasonable prospects of commercial success. Of course, there are cases in which the answers to some of the questions are negative, and yet the navigation can still be a success. Furthermore, in applying these tests, it often becomes a matter of opinion as to what answer to give. For example, how near must the inland waterway lie to the industrial area, for this aspect to be regarded as satisfactory? In a number of proposals for enlarged waterways in Great Britain, the plan has been to site a waterhead as much as twenty miles away from the industrial towns, and to rely on road haulage for the balance of the journey. The doubt is at once introduced as to whether the goods might not be shipped all the way by road. Ideally the goods should be moved to and from points alongside the waterway and when this is the case the route can suffer from other disadvantages and still prove to be a success. This is, however, rarely possible, although there are such cases as canals which could carry a considerable coal traffic from colliery to power station, if both were sited on its banks. Such exceptional cases would not need to satisfy the criteria laid down in questions 1, 2, 3 and 5, and the canal boats would never have to work in estuarial waters. To meet a need of this sort many miles of canal were built, at the beginning of the nineteenth century, to convey coal from colliery to industrial users, but today many of these conveniently situated collieries are now worked out or no longer provide the right grade of coal. Hence are seen power stations, sited by rivers and canals, in order to enjoy and, incidentally, pay for the use of cooling water, whilst their coal arrives in tipping lorries.

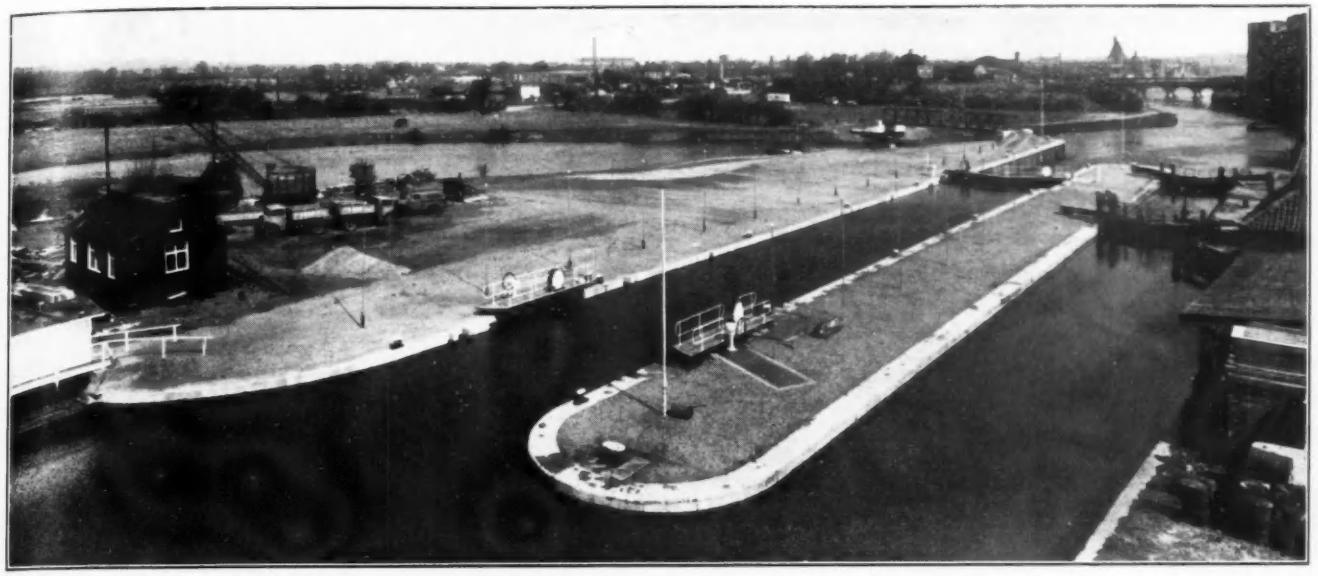
The decision, by the Electricity Authority and the Coal Board, to convey coal by means other than canals or rivers alongside the power stations has rightly caused some disquiet. On the issue of cost alone, this decision cannot be questioned, for it must be presumed that these Authorities have studied fully the availability of suitable coal and the potentialities of the alternative means of transport. However, a powerful case can be made for greater regard to be paid to issues other than economic ones, such as the desirability of reducing danger on the roads by directing traffic from them, even at some immediate extra cost. This might mean the allocation of coal for a particular power station from a colliery further away, but which is sited close to a waterway; alternatively it might involve tolerating a more circuitous waterway route; even if a short road haud, along a colliery access road to the point of loading the boats, is necessary, this is preferable to making the whole journey by road.

However, the particular case of coal to power stations apart, and this traffic is likely eventually to be eliminated by the use of atomic power, the goods which are likely to represent profitable cargoes on inland waterways are largely those to be moved to and from port areas. How close to the point of consumption or supply, inland, the goods can be taken by water, is thus of paramount importance, in view of the threat to carry by road all the way, if the final, or initial, road haul is lengthy. Fortunately, the pattern of trade today often involves trans-shipment or delivery to warehouse at some point between port and consumer (in the case of imported traffic). In such a case, if there are good warehouses available alongside the waterway, the water route should have merit, provided the final road haul is short.



Map of Inland Waterways in Great Britain, showing the Trent Navigation (North Eastern Division) and its connection with other waterways.

British Inland Waterways—continued



Town Lock, Newark. Downstream view of new lock, showing old lock to the right. A new workshop has since been erected on the vacant ground in the middle of the picture.

Capacity for Estuarial Craft.

Obviously the size of craft and the man-power per ton-mile (including a proportion of the man-power represented by lock-keepers, lengthsmen, toll clerks and the important item of maintenance personnel) is a vital factor; but it is a matter about which no rule as to minimum economic unit capacity can be dogmatically applied. Broadly, boats or barges with a capacity of over 100 tons, working in trains of four to carry around 500 tons seem to be required to compete with other methods of transport. For the 500 ton unit, the waterborne crew will number 8 or 9. Accepting an over-simplification in the calculations, this compares favourably with road haulage employing one man on a truck for 8 tons, or two for 15 tons, conveyed at about five times the speed. But this neglects the inherent advantage of the complete mobility of the road unit. In contrast, many miles of canal are limited to narrow boats, with a unit capacity of 50 tons per pair, and the equivalent of a crew of two.

But it is not only the questions of capacity and speed which militate against the economic operation of the small narrow boats; an almost necessary pre-requisite to success is that the boats which make the inland journey can trans-ship cargo to and from sea-going ships at a port, to which the waterway leads. When this is possible, as has repeatedly been stressed in authoritative comment, inland water transport starts with important advantages.

In the first place, all parties benefit from the more rapid cargo handling at the port, which follows from loading or unloading some half of the cargo overside into lighters. Secondly, in most ports, reduced or no dues are paid for discharge of such cargo. Thirdly, the cargo can often be well on its way, before road or rail borne goods find their way out of the congestion in the port area. It is in this respect that narrow boat canals suffer, since the loaded boats cannot safely operate in estuarial waters. Consequently, for example, import traffic to the Midlands from London Docks, if it is to go by canal, must be loaded into lighters in the docks for Brentford (or Regents Canal Dock), to be trans-shipped there to narrow boats. This nullifies the advantage accruing from originally unloading overside.

The capacity, and appropriate geographical location, of an inland waterway to pass boats which can also act as lighters in the port area is an almost essential feature. The size of the boats, and the number which can be penned in each lock, are themselves important factors, but are overshadowed by this criterion.

The Trent Route.

In this respect, as in many others, the route of the old Trent Navigation Company is favourably placed. Despite many difficulties, experienced before the navigation was taken over by the British Transport Commission and since, progress has been continuous. Whenever schemes of improvement have been effected, these have proved to be profitable, due as much to the enterprise of those concerned as to the economic criteria outlined above, and despite all the disadvantages inevitably associated with a river liable to serious flooding and needing constant dredging of a substantially gravel bed.

The part of the River Trent which is at present commercially active extends from Nottingham down to the Humber, on which estuary lie the important ports of Hull and Grimsby and Immingham. For the last 26 miles from Gainsborough to the sea, the tidal river is controlled by the Humber Conservancy. From Nottingham to Gainsborough, and above Nottingham to Derwent Mouth (where the Trent and Mersey Canal joins it), the river was controlled from 1783 by the Trent Navigation Company, and now by the British Transport Commission, over a total distance of 68 miles.

Mr. J. T. Evans, in his admirable monograph, "Notes on the History of the River Trent" records evidence of early navigation on the river. "From the Norman Conquest," he writes, "to the 18th century, the history of the Trent is one of conflicts between town dwellers, merchants and those engaged in transport, on the one hand, to whom the river was the main artery of trade from Nottinghamshire to Yorkshire and to Lincoln and Hull and the sea, and those engaged in agriculture, milling and fishing on the other, whose interest it was to obstruct the channels by weirs and staunches of all sorts, including fish weirs and kiddles, as they were called . . . Gradually over a long period obstructions such as these were reduced by the exertions of public spirited and interested individuals with the support of the Corporations of the towns on the river. That their efforts were successful is shown by the fact that no Act of Parliament was considered necessary for the improvement or maintenance of the Trent Navigation for 200 years after Acts had been passed for the improvement of the other principal rivers of the country. So numerous were the Trent boats that in 1770, even before the passing of the first Act for improving the river below Nottingham, it had been made obligatory for all Trent boatment to show on their craft the owner's name and address. This measure was not introduced for licensing or toll purposes, but was considered necessary on account of the great irregularities of the boatmen, and their continual trespass on the lands adjoining the river. Similarly the early Trent Navigation Acts contained

British Inland Waterways—continued

clauses prohibiting the boatmen from carrying guns or sporting dogs. Throughout history, boatmen have not enjoyed a good reputation. This may be partly deserved or it may be due to the fact that the boatmen have not been nearly so vocal as their critics. Possibly if one of the boatmen had written a book he would have had a thing or two to say about the land owners and the people who were responsible for the obstructions which in the absence of any Authority charged with the duty of maintaining and improving the river they found very difficult to get removed."

In 1783, the original Trent Navigation Company was established to improve the channel from Shardlow, near the junction with the Trent and Mersey Canal opened in 1777, to Gainsborough, although there was a cut at Newark under the control of the Newark Navigation Commissioners. Mr. Evans shows that this cut, which now forms part of the main traffic route through Newark, was probably made in the 14th century, with the object of diverting water from the Old Trent to mills on the River Devon, on which Newark stands. The River Trent itself skirts Newark in a wide sweep; this part of the river is not now used for navigation, all traffic passing down the cut to join the River Devon and following its course to Crankley Point, where a junction is made with the River Trent. In this cut and River Devon, there are two locks, sited more or less where the original Newark Commissioners built locks, and today the width of the navigation is rather restricted over this section, although there seems ample depth.

The Trent Navigation Company appointed William Jessop as their engineer and he proceeded to investigate possible schemes for providing the improved navigation with a depth of at least 24 inches, as required in the Act of Parliament obtained by the Company. One scheme to provide a depth of 4 feet, involving 21 locks was not adopted, and the alternative was accepted. This latter scheme included a few locks and relied upon much dredging and the use of training weirs to give the necessary improvements.

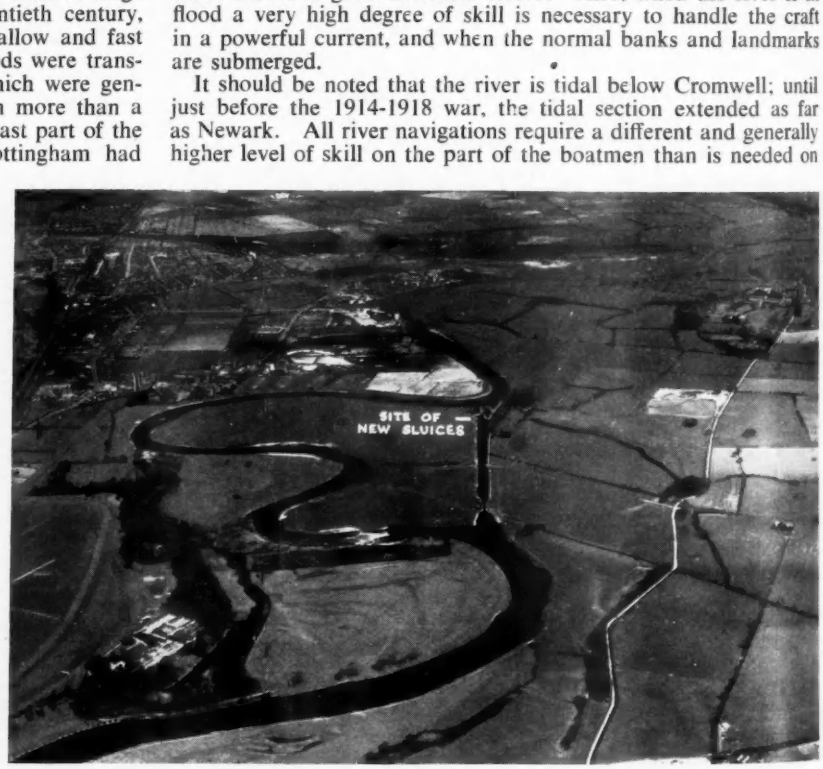
The City of Nottingham has always been interested in maintaining its position as the effective waterhead on this route, and has been unsympathetic to extensions of navigation, at least in large craft, beyond their town. However, until the twentieth century, the river between Newark and Nottingham was shallow and fast running, with a fall of 19 inches to the mile. Goods were transshipped at Newark from the lower Trent boats, which were generally propelled by sail, to shallow craft, and often more than a dozen horses were needed to haul 40 tons over the last part of the journey to Nottngham. The Corporation of Nottingham had been interested in improving navigation to their town, although preferably not beyond, for many years and welcomed the proposal of the Trent Navigation Company to modernise navigation, especially above Newark. In 1906, the Company obtained parliamentary sanction to dredge to 5 feet, and to build six new locks, the work to be completed in ten years. By 1914, only Cromwell Lock five miles below Newark had been built. After the war, the City of Nottingham took a hand, partly with the object of reducing flooding in the Nottingham area, and by 1928 the work had been completed, much of it under the direction of Colonel Rayner.

At the time of Nationalisation and the 1947 Transport Act, the route was working to the standard envisaged in the 1906 Trent Navigation Act. The nominal dredged depth at normal summer level was 6 feet over a channel width of 60 feet. But there remained a number of bottle-necks which not only resulted in traffic delays, but prevented the passage of boats larger than the so-called Standard Trent Boat (82-ft. 6-in. by 14-ft. 8-in. working to draft of between 5-ft. and 6-ft. 6-in.). At this time however the navigation was busy, although considerable arrears of maintenance had accumulated, and some of the warehouses, workshops and wharfage facilities left much to be desired.

An Evaluation of the Trent Navigation in 1947.

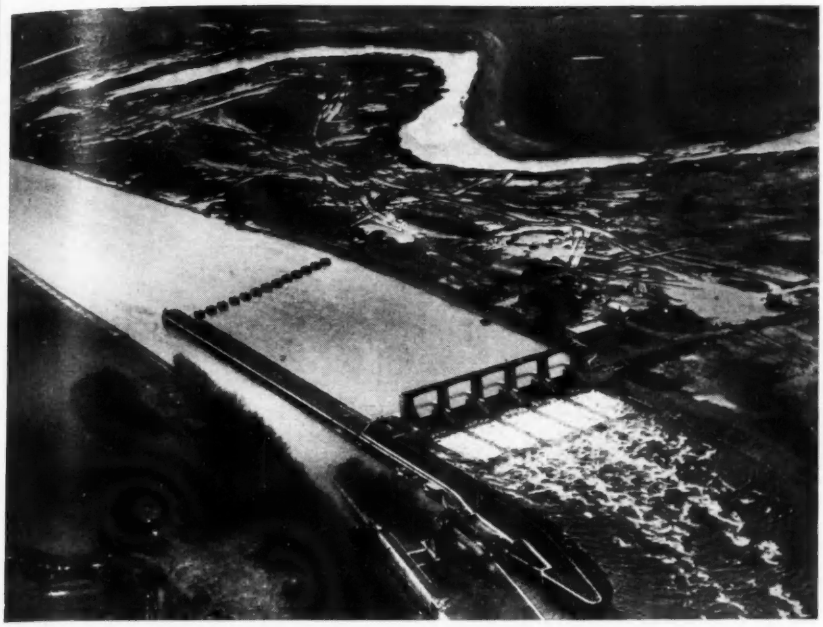
It is relevant, before giving any account of improvements since the last war and of proposed and possible further modernisation, to assess the economic potentialities of this navigation as at the time of the 1947 Transport Act. Referring to the criteria, which, it has been suggested may be useful in this endeavour, it will be seen that this route connects with a very important port area, and craft can and habitually do operate as lighters in the port area, before proceeding up towards Nottingham. This town is an important centre of industry, but there lie beyond other important industrial centres (Leicester, Burton-on-Trent and even the Birmingham area) which are out of reach by Standard Trent Boat; traffic for these points must be trans-shipped into either Upper Trent Boats of about 50 tons capacity, or narrow boats. The former, measuring about 70-ft. by 14-ft. can pass to Loughborough and Leicester up the navigable River Soar, which was previously known as the Loughborough Navigation and the Leicester Navigation and became part of the Grand Union Canal network. Burton can be reached via the Trent and Mersey Canal, which has 14-ft. locks to Burton, but which is not practically navigable for anything but narrow boats. Birmingham can be reached by narrow canal by more than one route, on all of which, however, the present draught is restricted. The route seemed therefore to pass the test as far as Nottingham, but no further. The Standard Trent Boats carry about 500 tons in a train of four, and usually consist of one powered boat and a number of dumb craft. It has been found advantageous frequently to work the powered boats as tugs, and to carry all the load in the dumb boats. At this time all but one lock and Holme flood lock accommodated four of these Trent Boats. Maintenance costs are not excessive, although there is responsibility for weirs and in connection with flooding, in association with the River Board, whilst dredging must be done continuously. But, there is noticeably more up-gate traffic (from the Humber) than there is traffic in the other direction. Finally, in times of exceptional flood, traffic may be stopped at Newark, when the flood gates there are closed. Also, when the river is in flood a very high degree of skill is necessary to handle the craft in a powerful current, and when the normal banks and landmarks are submerged.

It should be noted that the river is tidal below Cromwell; until just before the 1914-1918 war, the tidal section extended as far as Newark. All river navigations require a different and generally higher level of skill on the part of the boatmen than is needed on



Aerial view of the navigable channel and Colwick Loops prior to the recent improvements. Holme Flood Lock, with its restricted width, can be seen at the entry to the navigable channel, close to the old weir.

British Inland Waterways—continued



Aerial view of the new Holme Sluices. The old Colwick Loops can be seen in the distance; these have been sealed off from the River. In the foreground of the picture is Holme Lock, and the small lock now only used by small boats. It will be noted that the Holme Flood Lock has been completely eliminated.

canals, where the position of the navigable channel is usually fairly obvious. Furthermore, the draught varies with the season, and the existence of a substantial current, itself variable, call both for special knowledge and for modifications in operating methods and loading. The fact, however, that so large a part of the voyage from the Humber to Nottingham is made over a part of the river which is tidal introduces difficulties and imposes limits on the best timing of journeys in either direction.

Improvements since 1947.

Despite the difficulties of the immediate post-war situation and the frustrating delays, which are now accepted as customary in any activity which is the object of political interest and, hence, indecision, the British Transport Commission has already removed the two most serious restrictions on this route. These were, firstly, Town Lock at Newark, which was only capable of passing one Standard Trent Boat at a penning, whilst all the others could pass four, and secondly Holme Flood Lock and its approaches. The new Town Lock at Newark has been working satisfactorily since 1952,* and as a result, not only has normal cargo traffic been facilitated, but there has developed a healthy oil carrying traffic in vessels of up to 250 tons capacity as far as Colwick, a few miles below Nottingham. Holme Flood Lock only had to be worked in time of flood, but at all times it restricted width to something under 15-ft., and is believed to have restricted loading. Now that the new Holme Sluices have been built (as reported in this Journal for July, 1955) and the Flood Lock has been removed not only will flooding be more easily controlled, but vessels of up to 250 tons can reach Nottingham. Meanwhile, arrears of maintenance both on weirs and on bank protection, together with dredging are being overtaken.

Future Programme.

Considering the route as far as the City of Nottingham only, there remains much that could be done to improve the navigation further, both to improve working conditions for the present Standard Trent Boats and the oil tankers now working to the environs of Nottingham, and to pass even large craft such as the "Shell Farmer" (145-ft. by 29-ft. (m.) by 8-ft. 6-in. (m.) draught), which is now working on the navigation, but only as far as Torksey oil depot, between Newark and Gainsborough. How much will be done must depend on Government sanction, as well as upon the influence and energy of the independent oil carriers who have developed that trade so far, and the officers of the Commission.

The two limiting factors at the moment are the working draught and the width. The former could be improved by an intensive, and expensive programme of dredging, together with bank protection. It is questionable, however, if this alone would meet the needs of the case, in view of the fact that some of the most serious restrictions on draught occur below Cromwell Lock, in the tidal section. A scheme including the building of another lock and sluices or weir at Torksey would seem to be needed, and further control of a similar sort might be needed even lower down the river. Any extensive dredging programme brings with it the problem of spoil disposal, and in this connection the recent announcement that the British Transport Commission is to re-equip their sand and gravel depot at Wincolmlee (Hull) is welcome. This depot will result in the disposal of gravel spoil becoming a profitable business, and will have the further effect of increasing the downgate traffic, and reducing empty boat working. There seems to have been rather more delay in reaching a decision about this proposal than should have been allowed in the national interest. At the same time, when this depot is working efficiently, it will no longer be tolerable to dispose of gravel dredgings, as at present, by dumping them back in the river, only to be washed away to form new shoals. As to width of the channel, now that the two narrower locks have been elminated, the two most serious restrictions occur under Newark Town Bridge, which carries the Great North Road over the navigation, and at the head of Newark Nether Lock. Town Bridge is a difficulty indeed, with a width of 20 feet, since it not only carries enormous road traffic, but it is of historic value. To cut a new parallel channel and build another bridge would be very difficult in this urban area, and the alternative, to avoid both these restrictions, might lie in making the Old Trent round Newark navigable for through traffic.

The improvements which have been authorised for early completion* consist of the Wincolmlee gravel depot, and the provision of a new transit shed and cranage at Trent Lane depot and new wharfage and shed space and and improved unloading at Meadow Lane depot, both these at Nottingham. At the same time the depot at Colwick below the previous bottle-neck at Holme is to be vacated, and this concentration of trans-shipment facilities should result in welcome economies.

Access to beyond Nottingham.

The possibilities of extensive modernisation of the present routes, now limited in capacity, to other Midlands towns have much in their favour, and it is hoped to enlarge on this in future issues. There is also the Fossdyke Canal from the Trent to Lincoln; this has good potentialities and is quite busy now. Most unfairly its operating accounts show a working deficit, due to an annual outgoing of some £10,000 to meet an agreement entered into by the Railway Company who had the navigation rights prior to Nationalisation in 1947. The agreement to pay the original owners this annunity, and a similar one in the case of the River Witham, had been presumably readily accepted by the Railway Company in order to dispose of objections to their projected railway line. These items would surely more appropriately appear in the Railway accounts of the Commission.

Conclusions.

In conclusion, it is satisfactory to note that both tonnage and receipts continue to increase for the Trent Navigation. Of about

*See the July 1952 issue of this Journal.

*See The Dock and Harbour July 1955.

British Inland Waterways—continued

700,000 tons annually, over 200,000 tons is represented by oil traffic, carried exclusively by carriers independent of the Commission; their enterprise and, no doubt, the influence which they have brought upon the Commission to proceed with improvements is wholly to be welcomed. At the same time, of the general merchandise, including gravel, which represents the balance of traffic, the majority is carried by private traders, with an important minority conveyed in the boats of the Commission. This combination seems generally to be satisfactory, and is evidence of the high commercial esteem in which the route is held.

We are grateful to Mr. W. L. Ives, of British Waterways Headquarters and to Messrs. G. E. Willbond and H. S. Jesperson, District Traffic Officer and District Engineer of British Waterways, and to members of their staff, for the facilities which have enabled this independent survey to be made. We have also been glad to make use of information contained in the monograph by Mr. J. T. Evans, previously Engineer and General Manager of the Trent Navigation Company, and now Research Officer (Docks and Inland Waterways) with the Transport Commission, and that contained in the works of Mr. Charles Hadfield the historian.

G.L.H.B.

Breaking Waves

A Comment on the Genoa Breakwater

By R. R. MINIKIN

The frank account of the Genoa breakwater failure given by Dr. Mario Grimaldi* is more than a post mortem examination of that structure; it is a brief but important contribution to the history of maritime defences. In no doubtful or ambiguous fashion he details the inherent weaknesses of the design and material and he exposes, with sympathetic respect, the frailty of human judgment. In sum, his report is unique, without any attempt to justify past errors, and for that reason it should be of great value to the profession.

In 1949 the writer† called attention to several features of the Genoa Breakwater which are worth repeating as they throw a light on the great care taken by the early engineers in the investigation of the local sea conditions.

Several decades ago, when the Genoa East Breakwater was destroyed, the late Professor Luigi Luiggi carried out a series of experiments to arrive at the total thrust of breaking waves. Dynamometers were fitted at the remaining mole at Genoa and storm wave pressures were recorded. At the same time during the reconstruction of the damaged mole, he dumped on the longitudinal axis of the mole conical heaps of quarried waste of various sizes. These stones were graded into weight groups and placed in position by hopper barges. The apices of the cones of material up to 2 lb. weight in air were brought up to 15-ft. below sea level during calm weather. After a storm, soundings were taken which showed that the cone had been flattened, leaving the top at 46-ft. below sea level. He therefore deduced that below 46-ft. depth stones of 2 lb. weight were unaffected by surface waves. Similarly stones of 10 to 100 lbs. weight group stabilized at 23-ft. below sea level; stones 100 to 1,120 lbs were levelled off at 15-ft. below sea level. Some concrete blocks 28 tons weight in air were placed on a rubble bench at 15-ft. below water level. It was found that one isolated block was displaced but if two blocks were placed together they held their position. Building up the 28-ton blocks to 10-ft. above sea level provided sufficient resistance to withstand storm waves which washed over them.

From the data thus obtained, Professor Luiggi devised a diagram (see Fig. 1) to represent the distribution of pressures against a vertical wall from waves of 23-ft. amplitude (7 m.). Another interesting point is that in the absence of wind the moles were sometimes subject to storm waves of 23-ft. in height and sent jets of green water 80-ft. into the air above the breakwater.

Some ten years or so later the late Professor Coen Cagli carried out full scale measurements of wave action on the then Prince Umberto mole and formulated the following:—

1. The maximum intensity of pressure of oscillatory waves is generally a little below still water level and is sensibly equal to the hydrostatic head due to the height of the waves.
2. Above still water level the intensity of pressure diminishes rapidly notwithstanding the fact that they may reach a height, on impact, of double the height of the open sea wave approaching the wall.
3. He suggests that this is due to a combination of static and dynamic effort of the waves on impact.
4. Below still water level the intensity of pressure diminishes slowly in proportion to the ratio of height to length of wave.
5. The intensity of pressure at the foot of the wall is never less than half the maximum intensity, and is a minimum when when the waves are short in comparison with their length,

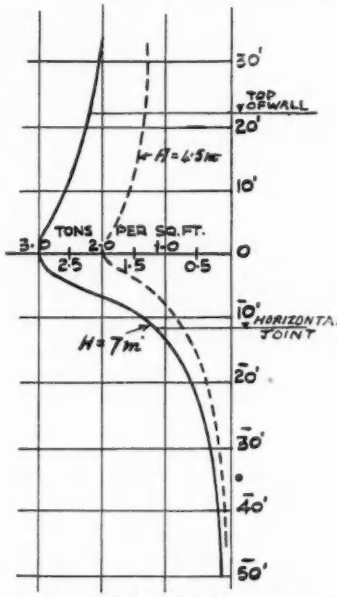


Fig. 1 (left). Breaking wave pressures against a vertical wall. Diagram due to Professor Luiggi.

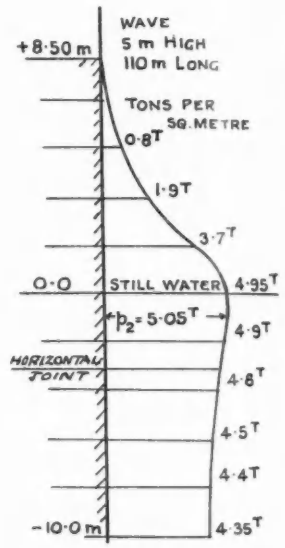


Fig. 2 (right). Oscillatory wave pressures against a vertical wall. Diagram due to Professor Coen Cagli.

and becomes more nearly equal to the maximum intensity as the length of the waves increase in proportion to the height.

To supplement the full scale tests he undertook experiments on reduced scale models in collaboration with Professor Stuckey and one of the many important conclusions to which they came was that oscillating waves particularly in storms, are not connected with standing waves after reflection from a vertical wall, but they remain trochoidal waves and exert pressures far in excess of those that would be produced by standing waves resulting from reflection of the same trochoidal waves. The diagram of pressures they produced as a result of their researches is shown in Fig. 2. They conclude . . . "it is therefore justifiable to conclude that, if the depth of the sea at the site of the works exceeds, as is usually the case, twice the height of the greatest storm waves to be expected in the locality, and if the foot of the vertical wall lies at a depth of one and a half times the same height, there should be no more danger of waves breaking completely against the work. However it should be noted that waves accompanied by strong wind are sensibly shorter than waves of the same height unaccompanied by wind."

It was in 1933 that Professor Cagli replaced the cellular blocks of the Genoa breakwater by well blocks after his investigations of the second collapse of the Catania moles, and not so long after, he expressed his doubts even about those. As a result of further consideration he later changed the blocks to the cyclopean type.

There is little doubt that the waves assaulting the Genoa mole in February last were breaking waves at the wall face, and as a matter of interest the writer would like to take the opportunity of recalling an empirical formula for breaking waves which he suggested some years ago. It was primarily based on examples of

Breaking Waves—continued

failures and Professor Bagnold's experiments.

Applying it to the cross section of the Genoa mole where the large breach occurred (see Fig. 3), it is assumed that the peak pressure is at still water level and diminishes in value to zero at half wave height above and below the still water level respectively

$$p_m = 2.9\ d\ (I + d/D)\ H/L \text{ tons} \qquad (1)$$

where d = depth of water at the vertical face of wall in feet.
D = depth of water at the toe of the mound in feet.
H = amplitude of out-at-sea wave in feet.
L = length of the wave in feet.
p_m = the peak pressure at still water level per foot run in tons.

The pressure ordinates at intermediate points are

$$p_y = p_m - \left\{ p_m \left[I - \left(\frac{H - 2y}{H} \right)^2 \right] \right\} \text{ tons} \qquad (2)$$

where y is the vertical distance plus or minus about the still water level.

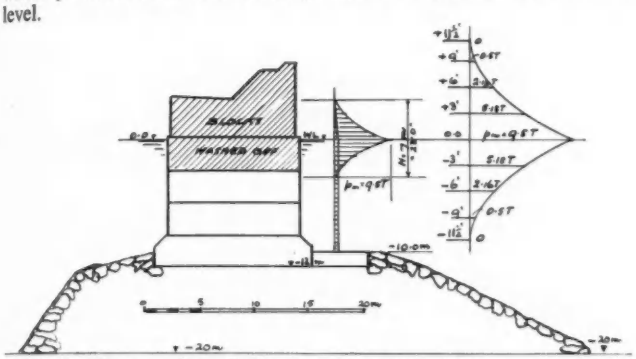


Fig. 3. Cross section of Genoa mole and breaking wave pressure. Diagram due to R. R. Minikin.

The total pressure against the vertical wall is therefore the area of this diagram plus the hydrostatic pressure shown as a triangle above W.L. and a slender strip from there to the toe block and is,

$$p = 0.96\ d\ (1 + d/D)\ H^2/L + H/70\ (d + H/4)\ T \text{ per ft. run} \qquad (3)$$

The storm wave height at Genoa was estimated at 7 m. (23-ft.), and assuming a wave steepness of 1/15 that would be 345 feet for the length of the wave, then the peak pressure given by expression (1) is

$$p_m = 2.9 \times 32.8 \left(1 + \frac{32\ \ell}{65.\ell} \right) \frac{23}{345}$$

$$= 9.5 \text{ tons per lineal foot}$$

from which the diagram Fig. 3 is drawn. Taking intermediate ordinates at, say, plus and minus 3 feet intervals from still water level and inserting in (2) we have at +6 and −6 feet

$$p_6 = 9.5 - 9.5 \left[1 - \left(\frac{23 - 2 \times 6}{23} \right) \right]$$

$$= 2.16 \text{ tons}$$

The area of the diagram is approximately $9.5 \times 23/3 = 73$ tons per lineal foot for the dynamic effort on the wall over the extent shown in the smaller diagram.

Using the same terms for Luiggi's and Cagli's diagrams, we get over the same portion of wall 80 tons and 40 tons respectively. (Cagli's is deduced pro rata for 7 m. wave height.)

Since the dry weight of the transported blocks was 65 tons per lineal foot and the originally assumed coefficient of friction was .7, resistance against free sliding over the lower blocks, would be 47.5 tons, without making allowances for buoyancy, uplift and side pressures or arching effects. Without full data one cannot draw definite conclusions but at least one point made by Dr. Grimaldi is clear—the technical knowledge of the dynamic effort of the breaking wave is still inadequate, and the particular causes of the break not yet revealed.

---

* See August, 1955, issue.

† Winds, Waves and Maritime Structures by R. R. Minikin. Published by Charles Griffin and Company Ltd., 1950.

Grain Elevators for Humber Ports.

Among the improvements at the Port of Hull about to be put into effect by the British Transport Commission is the installation on the North side of King George Dock of a set of four travelling pneumatic grain intake elevators now being manufactured by Messrs. Spencer (Melksham) Limited, of Melksham, Wiltshire.

These plants will handle all classes of cereals, including wheat, maize, barley, oats, soya beans, flax and linseed, at a maximum rate of 150 tons per hour per elevator.

The four units are designed to travel on a 15-ft. gauge rail track running the full length of the quay, the power to operate them being supplied through flexible cables. As a standard gauge railway runs down the centre of the elevator track, the elevator carriage framing is shaped to form a portal structure to enable railway wagons to pass underneath, so enabling the normal loading and unloading of general merchandise to proceed without interference.

The upper portion of each elevator carriage houses the machinery, and is covered with aluminium sheeting, ample window lighting being provided, in addition to a special crane type window on the front to give the operator an unobstructed view of the ship from his cabin. The carriage is mounted on four two-wheel bogies, two of which are driven by means of synchro-mesh motors.

The grain is sucked out of the ships' holds by means of special nozzles suspended from vertical steel pipes having power-operated telescopic sections to enable rapid adjustment in height to be carried out, these pipes being suspended in their turn from horizontal piping carrying the grain to the receiving canister, and forming part of hinged booms equipped with power-operated slewing and luffing gear, all controlled either from the cabin on the machinery floor, or by means of push buttons from the deck of the ship.

The mast carrying the pipe booms is mounted on the top floor of each travelling carriage, as also is the grain receiver. The latter incorporates special features to reduce wear and damage to the cereals being handled, and is equipped with a safety device to prevent it from being flooded with grain should obstructions occur in the flow from it.

To avoid loss of vacuum in the receiver, a rotary air-lock or discharger is fitted to its outlet, safety devices being provided to stop the plant should a foreign body present in the grain obstruct the rotor.

After leaving the discharger the grain is directed either to railway wagons or into the quayside tunnel and thence on to existing belt conveyors feeding the storage silos at the head of the dock. When feeding wagons the grain passes through a hopper equipped with a special device to control the flow when nearing full capacity.

The air carrying the grain to the receiver is drawn from the latter through a cyclonic dust extractor, into a final separator for removing very fine dust and thence to the pumps, from which it is blown into the atmosphere. The dust collected from the air stream passes through rotary air-locks into a screw conveyor, which either returns it to the grain or to a sacking-off outlet.

The vacuum pumps are of the vertical double-acting reciprocating type, two being mounted in each elevator carriage, and driven together from an electric motor by means of steel roller chain gearing running in an enclosed oil bath.

The installation of this equipment will greatly improve the port facilities, not only enabling ships to be turned round much more quickly but also enabling the work to be carried out under much cleaner conditions with the minimum of physical effort.

Re-opening of Portavogie Harbour.

The harbour at Portavogie, Co. Down, which has been reconstructed at a cost of £210,000 was re-opened early this month. The improvement scheme, which was undertaken by the Down County Council with financial assistance from the Government of Northern Ireland, has provided a minimum of 6-ft. of water in the inner basin and 12-ft. in the outer harbour at low tide, which will enable the fishing fleet to enter the outer harbour at all times. Additional berthing space has been provided by a 50-ft. extension to the main breakwater. The existing wharves in the inner basin have been widened and lengthened, and a wharf has been run out into the outer harbour to accommodate coastal vessels of up to 120-ft.

Personalia

Appointments and Staff Changes

It has recently been announced that **Mr. G. A. Wilson,** M.Eng., M.I.C.E., M.I.Mech.E., Chief Engineer of the Port of London Authority, has been appointed to succeed the late Sir Athol Anderson, K.C.B., as one of the British nominees on the International Consultative Works Commission of the Suez Canal.

Mr. Wilson, who is 49, was educated at Wrekin College, Shropshire, and after a mechanical apprenticeship at Leyland Motors graduated with honours in civil engineering at Liverpool University in 1929. In 1932 he obtained a master's degree in engineering at Liverpool University and associate membership of the Institution of Civil Engineers, which awarded him the Charles Hawksley prize. He became a member of the Institution of Civil Engineers in 1944 and a member of the Institution of Mechanical Engineers in 1951.

In 1929 he joined the staff of the Anglo Iranian Oil Company as an assistant engineer and served in Persia until 1930 when he became an assistant engineer in the Bridge Section of the Ministry of Transport. From 1932 until 1948 he was a member of the Civil Engineer in Chief's Department of the Admiralty, rising from Assistant Civil Engineer to Superintendent Civil Engineer and serving at Portsmouth, Chatham, Colombo, Singapore and the Admiralty. In 1948 he was appointed Deputy Chief Engineer of the Port of London Authority and became Chief Engineer in 1953.

Mr. Wilson is a member of a number of bodies including the Council of the Institution of Civil Engineers, the Hydraulics Research Board, certain technical committees of the British Standards Institution, the Thames Survey Committee and several governmental committees concerned with the prevention of pollution and flooding in the River Thames. He is also a member of the British National Committee of the Permanent International Association of Navigation Congresses and was recently one of the United Kingdom delegates to the annual meeting of the Permanent International Commission of Navigation Congresses held in Paris.

East African Ports.

Captain Alastair Smith, at present Port Manager in Mombasa, has been appointed Ports Assistant to the General Manager of the East African Railways and Harbours Administration.

Capt. Smith was born in Perthshire in 1901, and after spending some time with the British India Company and in the Royal Navy, he went to East Africa in 1920. During the recent war he was Berthing Master at Mombasa, and was a member of the Ports Committee of the Ministry of War Transport. He was awarded the M.B.E. in the 1944 New Year's Honours List, and the O.B.E. in the Queen's Birthday Honours List in 1954.

He will be succeeded at Mombasa by **Mr. J. F. C. Williams,** who for the last 17 years has served with the Railways and Harbours Administration in the Sudan.

British Transport Docks.

Mr. G. W. Spooner, A.M.I.Struct.E., Engineering Assistant, Civil Engineer's Department, Swansea Docks, has been promoted Dock Engineer (Civil), Port Talbot Docks.

Mr. G. W. Spooner served his apprenticeship with Messrs. Dorman Long at Middlesbrough and then spent 8 years in Canada with the Canadian Bridge Company. In 1934 he joined the former Great Western Railway Company at Paddington as a Draughtsman and was transferred to Swansea Docks in December, 1939. He returned to Paddington in October, 1944, as a Senior Surveyor and later was again transferred to Swansea in 1946. In 1954 he was appointed Engineering Assistant, Civil Engineer's Department, Swansea Docks.

Captain S. Baxter-Wright, Dockmaster, Barry Docks, has been appointed Dockmaster, Swansea Docks.

After spending 13 years at sea, Capt. S. Baxter-Wright entered the service of the former Great Western Railway Company as Piermaster, Barry Docks, in 1929. He served in a similar capacity at Cardiff and Newport Docks and was appointed Assistant Dockmaster, Barry, in July, 1944. In November, 1950, he was appointed Dockmaster at Port Talbot Docks, and returned to Barry as Dockmaster in June, 1952.

Mr. R. E. Takel has been appointed Estate Surveyor, South Wales Docks. He started his career in the District Estate Office of the former Great Western Railway Company at Cardiff. In 1942 he joined H.M. Forces serving with a Survey Battalion of the Royal Engineers. On demobilisation in 1946 he was employed as an Assistant in the District Estate Office at Cardiff and in 1951 was appointed Estates Assistant with the Cwmbran Development Corporation.

The appointment is announced of **Mr. William Jeffers** to be Chief Docks Manager, South Wales Docks, British Transport Commission, with headquarters at Cardiff. Mr. Jeffers succeeds Mr. A. E. H. Brown, who was recently appointed General Manager of the Scottish Region of British Railways.

Mr. Jeffers has had over 40 years' experience at South Wales ports. He entered the service of the Barry Railway in the General Manager's Office at Barry in 1913, and in 1922 was transferred to the Staff and Establishment section of the Chief Docks Manager's Office, G.W.R., Cardiff. In 1928 he became Chief Clerk to the Docks Manager, Cardiff and Penarth Docks, and his subsequent appointments comprised Assistant-in-Charge, Penarth Dock (1935); Outdoor Assistant (Coal Shipping and Traffic), Cardiff Docks (1937); Assistant Dock Manager, Barry Docks (1939); Assistant Dock Manager, Cardiff and Penarth Docks (1941); and Assistant to Chief Docks Manager, G.W.R. (1945). Following nationalisation of the railway-owned South Wales Docks, Mr. Jeffers was appointed in 1948 to be Dock Manager, Swansea.

During the war period Mr. Jeffers was Secretary of the Port Emergency Committee for Barry and later for Cardiff and Penarth. Subsequently he has held office as Chairman of the Swansea Port Employers Association and of the Swansea Joint Negotiating (Transport Workers) Committee; he is also a member of the South Wales Group of Port Employers, and of the Swansea Pilotage Authority.

Manufacturers' Announcements

New Fast Mobile Crane

A useful addition to the range of mobile cranes was demonstrated recently to the Modernization (Goods) Committee of British Railways by Messrs. Ransomes and Rapier Ltd., Ipswich. The Rapier 7 Fast Standard Mobile Crane is powered by diesel-electric and is equipped with clutch, three-speed gear box, reduction gear and Eaton two-speed axle for relatively high-speed travelling on the road at up to 20 m.p.h. It is capable of stopping and starting with complete ease on 1 in 10.

The crane is carried on pneumatic tyres, four in twin formation on the front axle and two on the steering castor. The castor axle is pivoted in a king-post at the tail of the crane, enabling the castor wheels to accommodate themselves to uneven ground so that the crane is always steadily supported on three points—the front wheel and the castor post. The crane is approximately 14-ft. in height, 7-ft. 7½-in. in width and 14-ft. 5¼-in. in overall length.

Girling internal expanding hydraulic brakes are provided on the front and rear wheels, and the chassis is a steel frame carrying front axle and the machinery bedplate, the jib being pivoted from an A frame structure. The diesel power unit is capable of developing 70 b.h.p. at the maximum governing speed of 2,000 r.p.m. The engine is fitted with a vacuum pump to operate the axle gear shift and the Hydrovac. The mechanical drive is through a 14-in. diam. dry-plate clutch with ball-bearing release to a specially designed gearbox giving three speeds forward and three speeds reverse with a single gear change lever.

The steering wheel drives through bevel gear to a worm gear on the top of the castor king-post. There are separate motors for derricking and hoisting, each of which is fitted with a self-adjusting magnetic brake which sustains the load or jib when the circuit is broken. Powerful regenerative braking can be effected by switching off the engine with the appropriate control in the "on" position. In this way the heaviest load can be lowered at creeping speed. The full derricking range can be achieved in 16 sec.

In the course of the demonstration the Fast Standard Crane picked up a BK-type British Railways container (which, with its 4-ton load, weighed 5 tons, 9 cwt., 3 qr., 22 lb.) from between two covered vans, using as little as 18-ft. 4-in. of a 29-ft. roadway beween tracks in the goods yard, and placed the container on a Scammell mechanical horse trailer which was loaded in three different positions. The crane then gave further evidence of its versatility by lifting a 23-ft. log weighing 3 tons 2 cwt. (plus 79 lb. of tackle) and carrying it at speed down the cartage road. The 14-ft. radius turning circle was also demonstrated.

New Automatic Chain Lubricator

A new automatic chain lubricator, now being produced by Clarke Chapman and Co. Ltd., Victoria Works, Gateshead-on-Tyne, is designed for use with all types of chain conveyors and can be engaged or disengaged, assembled or dismantled as a complete unit, while the conveyor is running.

The lubricator is arranged to work in conjunction with the chain sprocket wheels and is quite independent of chain speed. All mechanism of the lubricator is totally enclosed inside an oil tight aluminium case which forms an oil bath providing splash lubrication for the mechanism itself. Strongly constructed, the lubricator is simple and safe to operate and can be used by unskilled labour.

The unit is designed for working under very bad conditions, such as dust or steam laden atmospheres. When these conditions are encountered a simple air jet cleaning equipment is provided which automatically cleans each nipple before and after lubrication.

Various sizes of the lubricator are available depending upon the number of teeth in the sprocket wheel and the pitch of the chain. However, with two lubricators fitted at the tail end of a conveyor, the increase in overall width of the conveyor is normally never more than 18-in. When necessary the lubricators can be fitted at the driving head end of the conveyor.

Improved Fire Extinguisher

A new Wet Water Composite Pressure Charge for use in first-aid fire fighting on porous materials such as wool, cotton, upholstery, mattresses, woodshavings, sawdust, rags, straw and hay, has been placed on the market by Nu-Swift Ltd., the fire extinguisher manufacturers of Elland, Yorkshire.

In fire fighting, it has been found that plain water is handicapped by its surface tension, which prevents or retards it from spreading and penetrating into porous materials and therefore hinders the cooling of hot spots which, in the case of dangerous, deep-seated fires, is more important than extinction of surface flames. Otherwise, re-ignition from within may occur.

Wet Water has been tested in the United States on fire fighting and the use of Wet Water on deep-seated fires is said to bring about an increase of 50% compared with the fire fighting efficiency of ordinary water.

The Nu-Swift Wet Water Concentrate, which is of the non-ionic type, is held in the composite pressure charge in a plastic bag which is burst instantaneously and automatically when the extinguisher is operated. Claimed to be the first composite Wet Water Pressure Charge in the world, the new charge has been approved by the Fire Offices' Committee, but only for use in the Nu-Swift 2-gallon Universal (Royal Navy) Extinguisher, Models 1301 and 1300.

River Navigation Aid

Decca Radar, Ltd., have developed a new set (Type 214) with the object of providing vessels on inland waterways with a navigational aid in fog and bad visibility as well as darkness. The set has been demonstrated to many authorities on Rhine navigation, and although full production of the set will not begin until October nearly 100 orders have already been received from German and Dutch operators of Rhine craft. The set will also be supplied to shipping in three other rivers—the Mississippi, Danube and Po.

The application of radar to Rhine shipping has been studied by Decca Radar, Ltd., for two years and a large number of trial voyages with radar between Basle and Dutch sea ports have been made by the motorship "Valcava." The vessel was navigated with the wheelhouse blacked-out, representing the worst possible fog conditions, over a difficult stretch of the river between Koblenz and Camp to analyse and check the operational requirements. The new set, known as the Decca River Radar, has a very high-quality of definition at short range, which is sufficient for a ship to pick out other vessels, the banks of the river, buoys covering breakwaters and shoals and submerged objects of a hazardous nature to navigation.

The scanner is approximately 7-ft. wide and the display is a 9-in. constant-focus cathode ray tube display with six range scales.

Manufacturers' Announcements—continued

Menck Pile Driving Plant

Menck Pile Driving units have been manufactured for more than eighty years and are used all over the world. They operate not only in most European countries including the U.K., but also in India, Indonesia, Pakistan, Brazil, Argentina, etc.

Units can be supplied to drive piles up to 100-ft. Assembling and dismantling is both easy and quick as the frame consists of three sections only with very few bolted connections. The three-beam frame is of tubular steel, low in weight but of greater resistance and requires only one frame inclination screw so that jamming or twisting are impossible. It can drive its own foundations for the piles holding the rail track.

The self-contained leader consists in some models of three, in the smaller models of two sections. They are electrically welded and held together, at each of the joints, by four strong bolts. The box-section type leader is held in position, and arrested, at the frame head and is also guided below at the sliding bridge. When lowered for driving operations below ground level, the leader slides in these guides or oscillates in them when the sliding bridge is shifted. The leader is suspended in a universal oscillating joint so that it can follow a kicking pile. The catch bolt for arresting the leader is arranged on the guide in the frame head and may be engaged by a spring operated by tagline from the driving position. When lowered to major depths and at major rakes, the leader being self-supporting, does not need additional support. Leader head and leader foot and frame head are all equipped with catch bolts for the hammer which are operated by taglines from the upper carriage. The folding platforms are conveniently arranged on the leader and serve for maintenance of the hammer.

Pile Driving Plant in Operation.

Articulated steam piping conveys the steam from the boiler to the hammer and may be fitted to either side of the frame. It is suspended from the hammer trolley, following its upward and downward movements, and being indifferent to shocks, it has a considerably longer service life than that of flexible metal tubing. Each piling plant is equipped with two capstans for operating the jetting pipes.

The upper carriage, complete with machinery frames, is electrically welded. Only shaft bearings and parts too bulky for shipment are bolted. The four corners of the upper carriage are fitted with jacking screws which serve to jack up the plant or to turn the undercarriage into another travelling direction. These screws also serve as additional supports to the upper carriage when at certain raking positions and under extreme load. A ballast weight is required, however, for major forward leader rakes and for operating the plant as lifting crane or crane type piling plant. The upper carriage is rotatable through 360° to either side. All mechanical motions are operated through sliding wheels and claw-couplings.

The vertical cross-tube steam boiler, which is available for coal, timber or oil firing, is entirely welded and built for 142½ lbs./sq. in. working pressure. It has high steam production and is well protected against heat losses. The hammers are double and single acting and can be supplied up to a falling weight of 6¾ tons. For driving timber, concrete, steel or sheet piles the single acting hammers require the use of pile helmets. These are not needed, however, by the double acting hammers which are particularly well suited for sinking sheet piles.

Raking can be done up to 1 : 4 forward and up to 1 : 2½ backward, and with special gear backward raking can be done at an angle of 45° (1 : 1) Each movement of the plant is power-operated so that it can work at a high speed with the minimum of service personnel. It can also be operated as a crane or as a tower crane.

This pile driving plant is manufactured by Menck & Hambrock GMBH, Hamburg-Altona, British agent "Ronex," 22, Southern Road, London, N.2.

WANTED

Wanted back copies of "The Dock & Harbour Authority" prior to May, 1951. Complete sets only, from May to April, as these copies are required for binding into volumes. Please write to Box No. 172, "The Dock and Harbour Authority," 19, Harcourt Street, London, W.1.

APPOINTMENT VACANT

THE BRITISH TRANSPORT COMMISSION (Docks Division), 22, Dorset Square, London, N.W.1, invite applications for the post of New Works Assistant, Docks Engineer's Department, Garston Docks. Applicants should have experience in the design and execution of major new works including quay layouts, dock gates and the provision of cranes and other dock appliances and services. Preference will be given to applicants who are Corporate Members of a Senior Engineering Institution, but consideration will be given to applicants who, whilst not holding academic qualifications, have had suitable experience. The starting salary will be £950 per annum.

Applications, giving full details of qualifications and experience, should be sent to the Chief Labour Officer at the above address to arrive not later than 29th September, 1955.

FOR SALE

CHAMBERLAIN INDUSTRIES LTD.

OFFER FOR SALE

Ransomes and Rapier 8½-tons capacity Mobile "Super" type Crane. Standard type jib. Solids. Diesel or petrol.
Lorain 7½-tons capacity Lorry mounted Crane, type TMC3. 40-ft. jib. Diesel powered.
Cole/Thornycroft Lorry mounted 5-ton Cranes. Petrol/Electric. Pneumatics.
Coles Mobile. Model 90079. 5-tons capacity. Self propelled. Pneumatics. Diesel.
Coles Mobile. 2-tons capacity. 17-ft. jib. Pneumatics. Diesel.
Coles 1-ton capacity Mobile Crane, self propelled. Model 8506, 21-ft. jib. Pneumatics.
Cranemobile Mobile Crane. 4-tons capacity. Petrol. Pneumatics. Very fast.
Hyster Karry Kranes. 4-tons capacity. Solid or pneumatic tyres. Diesel or petrol powered.
Neals Mobile Cranes, type N and NM. 2-tons capacity. Pneumatics. Diesel.
Jones Super 22 Crane. 25-ft. Lattice jib. Pneumatics. Diesel powered.
Taylor Jumbo Crane. 2/3 tons capacity. Hydraulic luffing. Perkins P6. Pneumatics. (1¾ cu. yd. Grab available for above.)
Taylor Hydracrane. Mounted on Morris 4 f.w.d. chassis. Pneumatics. Excellent condition.
Cranemaster 2-tons capacity Crane, operated on "Case" pneumatic tyred Tractor. T.V.O.
Stanhay 1-ton capacity Crane. Petrol. Mounted solid tyres.
TD9 Tractor Crane. Fitted Gooseneck telescopic jib.
Chatteris Electric Luffing Crane, 1-ton capacity. 45-ft. radius.
Grafton 2-ton Steam Crane. Fully slewing. 30-ft. jib.
10-cwt. Wall Crane. 7-ft. 8-in. outreach.
10-tons capacity Derrick Crane. 100-ft. jib. 400 volts A.C.
Jules Weitz Tower Crane. Type G12. 2-tons capacity. 65-ft. jib.

For further details apply: Chamberlain Industries, Ltd., Staffa Road, Leyton, E.10. Tel.: LEYtonstone 3678.